

BULLETIN  
OF THE  
AMERICAN GEOGRAPHICAL SOCIETY

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Vol. XX

1888

No. 4

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CHINA AND ITS PROGRESS.

BY

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WHEN it is remembered that the area of the Chinese Empire is not far from 5,000,000 square-miles, or about one-tenth of the habitable globe, and that its population, although not definitely known, is probably somewhere between 300,000,000 and 500,000,000, or from a fifth to a third of all the people in the world, an idea, although a vague one, may be had of the magnitude if not of the importance of the subject chosen for the lecture of the evening. If you will recall the further fact that that vast region is now and always has been separated from the rest of the world by an almost illimitable waste of waters on one side, and by an almost impassable waste of sand, and desolate mountains and plains on the other, you will understand why China and its civilization are peculiar. Occupying eastern and southeastern Asia, China is as far away from the centres of the world's civilization as it

is possible to be. Its isolation is as yet absolute on the land side. No great commercial movement is possible across the steppes of Central Asia or the sands of Gobi until railroads are built, and even then the movement of Commerce, in order to become the efficient handmaid of modern civilization and modern progress, must necessarily be preceded or accompanied by a military movement, if not one of absolute conquest.

The significance of China's isolation will be more fully understood from a recital of the fact that the desert-belt separating it from Europe and northern and western Asia varies in width from one hundred to six hundred miles, and extends nearly ten thousand miles in unbroken solitude from the great bend of the Amur River entirely across Asia and Northern Africa to the Atlantic Ocean. Its general direction is west-southwest. The Nile flowing northward, and the Euphrates flowing southward, break through it, but the nations on the opposite sides of this belt have remained throughout all time essentially different from each other in race and civilization. It is true that the border regions of China have been the nursing ground of conquering tribes, but so far as history records they have not materially influenced the civilization of China and still less that of Europe. It is from this region that Genghiz and Tamerlane, driven by hunger and want, sallied forth to conquer the world. Although the story of their achievements on the borders of Europe constitutes one of the most interesting chapters of human history, we must pass it by, and turn for a moment towards China, where they were far more successful. They met here a weaker and less warlike resistance, and having relatively but a short distance to

march, they made an easy conquest. In less than one generation they overran the whole empire, and Kublai Khan, the grandson of Genghiz, became perhaps the greatest Emperor China ever had. It was during his reign that the Polos, Nicolo, Maffeo and afterwards Marco, the adventurous Venetian merchants, crossed the Black Sea, through Russia to Bokhara and thence over the Plateau of Pamir, and penetrated China from the west. The same general route was pursued by Ibn Batuta, an Arabian traveller, a few years later, and by the Jesuits in considerable numbers still later, and they doubtless exerted a marked influence on the individuals with whom they came in contact. It may also be true that, from the earliest dawn of civilization, an occasional Russian, Egyptian, Greek or Roman, more venturesome than the rest of his race, made his way into China, though it is absolutely certain that they failed to make the slightest impression on Chinese civilization. That civilization is and always has been Asiatic. It is entirely different from that of Europe, and could hardly have been more different if it had had its origin in another sphere. The Hindoos gave it the dead cult of Buddhism, and that is about all China ever got from the world beyond.

It is scarcely necessary to call attention to the fact that the sea, from the beginning of time down to the end of the Middle Ages, formed an absolutely impassable barrier between China and the rest of the world. The introduction of large sailing ships enabled Rafael Perestrello, a Portuguese mariner, to reach the southern coast in 1516, and as the ships grew larger and the spirit of commercial adventure became bolder, communication became

more certain ; but it was not till steamships were introduced that Europeans and Americans were brought into regular and frequent contact with the Chinese. This of course does not date further back than forty years, and for all practical purposes may be considered to date from 1861 only. But so rapid has been its development that at this time Hong Kong and Shanghai are reached by the steamship lines of every nation, and it is no exaggeration to say that they are among the most important seaports of the world. They are now on the highways of commerce, and are visited annually by travellers from all quarters of the earth. Hence they are centres of thought as well as of trade, and must play an important part in the progress of China.

It is not to be supposed that the members of this society require any explanation of the geography of China, but your guests will doubtless pardon me if I call attention to the fact that China proper contains 19 provinces, corresponding to our States, and covering an area about equal to that of the States east of the Missouri river, including Texas, Kansas and Arkansas, or say 1,800,000 square miles. Their governments are modeled on that of the empire. The governors are appointed by the throne, and hold office for three years, though this rule is frequently broken over for reasons of state.

The governor general of the metropolitan province Chihli, Li Hung-chang was appointed to that office in 1870 and has held it continually, except for a few months following the death of his mother. He is a pure Chinaman, a great scholar, a fellow of the Han-lin college, a successful general, a distinguished diplomat, the tutor of



the young Emperor, First Grand Secretary of the Empire, Head of the Admiralty, and chief adviser in military matters. In short he is the greatest and most progressive statesman of China, and plays a leading part, so far as any Chinese subject can, in all that concerns either its internal or external business. He does not, however, nominally hold any office in connection with foreign affairs, and yet no treaty or business connected with that department of the government is ever disposed of without consulting him. Having been thrown constantly in contact with foreigners during the Taiping Rebellion, and since that time, he has learned their ways, and knows how to deal with them, and in emergencies how to avail himself of their assistance. He is a crafty, kindly, liberal man, far in advance of the class to which he belongs. He is fully aware of his country's needs, and of the desperate straits into which its affairs are drifting, and under any other form of government, surrounded by any other condition of affairs, would long since have become its guiding power, if not its chief ruler. But he is a subject, and no one unacquainted with the principles and practice of Oriental Governments can understand just what that implies. I shall endeavor further on to give you some idea of it. Suffice it to say now that it is more powerful to restrain the strong than the weak, and holds even the great Viceroy strictly within the defined limits of his own official functions. All powerful as he is within his own sphere, the throne is so far above him, in whatever it chooses to reserve to itself, that the thought never enters his head to set up his own wishes or opinion against it. It is the centre of all authority, all law, all mercy, and in the Chinese system of government

stands immeasurably above all earthly powers and principalities.

But to return for a moment to the provincial governments. One other thing is worthy of note in connection with them. No man may be a governor general in his native province, nor in that of his wife, nor may his brother or any other close relation hold office in the same province with him. He is, however, in many respects, an absolute ruler, and has much to compensate him for his isolation.

The rivers of China generally flow eastward into the Pacific Ocean ; hence their deltas and valleys are open to the eastward, instead of to the southward, as ours are. The Amur, which used to be a Chinese river, but now is in the middle land occupied by Russia, between China and Siberia, the Hwangho, and the Yangtse-kiang, are the principal streams of the Empire, and give drainage and character to its surface. The great plains, comprising the delta of the Hwangho and the Yangtse-kiang, are about 700 miles long, by from 300 to 500 miles wide, and are as level throughout their extent as running water. They have a sea-coast line of about 1100 miles, and contain a population estimated at 125,000,000 souls. The chief cities in the Great Plain are Peking, Tientsin, Pautingfu, Chinanfu, Kaifongfu, Chinkiang, Suchow and Hankow. Nanking, the old capital of the Chinese dynasties, is situated on a plain surrounded by hills, but near the edge of the delta and about six miles back from the great river. It was the capital of the Taiping government, under whose direction a great part of it was destroyed. It has, therefore, lost its ascendancy as a metropolitan city. But so advantageously is it sit-

uated, that whenever China throws off the domination of the present dynasty, and again calls a native one to the throne, Nanking must once more become the seat of government.

All first-class cities are surrounded by high brick walls, crowned with crenelated parapets, furnished with buttresses, wet ditches, and iron-bound gates, which are closed regularly at sundown, and opened at sunrise, just as was the custom in Europe during the Middle Ages. The smaller cities are surrounded by mud walls or embankments, but all of them have brick walls at the gates. So much is this arrangement a necessary part of the national system, that if a new capital should be established anywhere, even for temporary purposes, as in Formosa a few years ago, no matter how poor the province might be, it would be deemed absolutely necessary to surround the government buildings and offices by a stone or brick wall thirty or forty feet high, and to furnish it with all the appliances of the Middle Ages. The one at Taipakfu in Formosa had been built only a short time when I visited the Governor-General of that Island. It was located in the middle of what had been a series of rice fields, and enclosed a square mile of land.

The walls of Peking, twenty-four miles around and about forty feet high, are a fair type of the city walls found everywhere, and also of the great wall wherever it is penetrated by the old highways, connecting the seat of government with the outlying dependencies. And here it may be worthy of remark that these city walls constitute by far the largest and most impressive works of the Chinese race, unless I except the great river embankments and the grand canal.

Here it may also be well to remark, that the grand canal generally occupies a series of river and creek beds, and is therefore quite crooked. Its embankments are also crooked, poorly constructed and sadly neglected, and the same may be said of the embankments of the great rivers. The canal has no locks, but is divided into reaches of greater or less extent by masonry sluices, which are wasteful of the water and render navigation difficult. As the canal runs through a region in which rain rarely ever falls except during the wet season of June, July and August, it is either running over with water, or has next to none at all, and in either case navigation is frequently suspended or materially interfered with. The construction of the canal was a great work for the age in which it was undertaken, but, like all the great works of China, it is far behind modern works of the same kind in other countries. Hundreds of thousands of dollars, every year, and not unfrequently millions, are spent to clean out the canal and restore navigation through it, but all the money which is not stolen is wasted. There is good reason for the opinion that the average sums thus disposed of would in three years build all the locks, feeder canals and other auxiliary works required to put the canal in good condition, and to keep it open for navigation at all seasons of the year except when frozen, and that ten years' capitalization of it, would build and equip a first-class double track railroad from Peking to the Yangtse-Kiang, a distance of 750 miles. So far as history shows, this wasteful system has never been interfered with or intermitted for eight hundred years. It affords rich pickings for the officials having charge of it and while many of them have been caught and banished

to Ili, or some other out-of-the-way province, for speculation, it is sure that this has been due to the fact that they were in most cases greedy and did not understand "addition, division and silence," rather than to any genuine disapproval of their rascality.

The Chinese people belong to the great Turanian or yellow race. They are remarkably homogeneous, and free from foreign intermixture. So far as I could judge from extensive travels in the interior, they are strong, healthy, robust and well behaved. They are frugal, industrious and kindly in their disposition, but neither warlike nor aggressive in temper, and can never have been a conquering or migratory people. Their isolation has protected them in the past, but they are now so numerous and so vital that any race brought in close contact with them must either dominate them or become swallowed up like drops of rain by the sea. They seem to be naturally conservative and slow to change their manners and customs, at least while living at home, where, it must not be forgotten, they are surrounded by a set of fixed and unvarying conditions, which hold them in their grasp and nullify all natural tendencies not in harmony with old custom or the traditions of their race.

They are democratic to a high degree, and all their institutions are calculated to foster democratic ideas and customs. They have no hereditary nobility except that of the Imperial Clan. Every man is naturally as good as his neighbor, and in fact, as well as in theory, every man has just as good a chance as his neighbor to become honored and respected by society. The only aristocracy is that of letters, and the only road to honor and fame and public office is through the public examina-

tions, which are open to all who choose to prepare and present themselves for the ordeal.

The most curious and interesting fact connected with China is that its government is the government of a conquering race. The present dynasty was founded by a petty Manchu Tartar chieftain, Aisin Gioro, and his grandson Nurhachu, who subjugated the neighboring tribes, overran the province of Shinking, and carried on war successfully for many years against the waning strength of the Ming dynasty. The latter was a Chinese dynasty founded by a great soldier, and in turn succeeded the Mongol Tartar dynasty of Kublai Khan, each of which ruled the country for something over two centuries. The most singular circumstance connected with the Tartar dynasties is that there never could have been at any time over two million Mongol or Manchu Tartars, and so far as history affords any evidence, the conquering army which placed the present dynasty on the throne could never have exceeded 250,000 men, and most probably not a third of that number. What the population of China was at that time cannot be determined, but it could not have been less than 100,000,000, and might have been as much as 200,000,000. It follows, of course, that such a conquest could not have been made unless the Chinese were divided and betrayed, or unless they were entirely devoid of military aptitude and military training. It is known that the Ming dynasty was effete, and it is certain that intrigue and treachery were important factors in shaping the course of events at that time.

The history of the Chinese government, and of the dynasties which have controlled it, is for the most part the history of intrigue, violence and anarchy, with only

here and there a great ruler to stay the hand of plunder and save the country from absolute ruin. Here, as in other Oriental countries, each dynasty begins with a vigorous and virtuous man, whose son or grandson may also have been virtuous and vigorous, but, whether native or foreign, the dynasty soon becomes corrupt and incapable. No matter what its origin, it adopts Chinese methods and civilization, and becomes Chinese in the end. The system which has come down from the remotest ages ultimately saps its vitality, and in the presence of the slightest emergency the sceptre falls from the nerveless grasp of the imperial puppet who holds it and for a while anarchy and confusion prevail.

The form of the government is an absolute monarchy of the patriarchal type. The Emperor is its sole responsible head. He has no regular ministry, but is assisted in carrying on the Government by a secretariat, and six great boards, whose duty it is to prepare business for his action ; and also by several courts, the greatest of which is the Censorate, or "all-controlling court." The Government being, as before stated, a government of conquest, every board and court is furnished with a Tartar president and a Chinese president, a Tartar vice-president, and a Chinese vice-president, a Tartar secretary and a Chinese secretary, and this division is carried into the membership, and as far as possible in the selection of the underlings, clerks and attendants. The Board of Censors is by far the most important body in the State. It stands next to the Throne, supervises and distributes all public business, and may petition the Emperor at all times and upon all occasions. Its operations are all-pervading and ever-

present. Wherever two or three Chinamen are gathered together, one of them is sure to be an agent of the Censorate, and this makes every Chinaman suspicious of every other Chinaman. The army is mostly under command of Manchus belonging to the Imperial Clan, and by these two powerful agencies the country is held in subjection.

The present Emperor was born in 1871, and is therefore only seventeen years old, according to our method of reckoning age; but as all Chinamen are regarded as a year old the first New Year after birth, he is now eighteen according to their count. He is not the son, but the first cousin of the last Emperor, who died without issue, and this is the first time the direct male line has failed in the history of the present dynasty. His father is known as the Seventh Prince—that is to say, he is the seventh son of the late Emperor Tau Quang, and the sixth brother of the Emperor Hienfung, who died young, leaving an infant son, and he in turn died almost immediately after reaching his legal majority. The present Emperor was chosen by family council—really by the two principal wives of the Emperor Hienfung, who were also sisters, and who as co-regents and empresses dowager, have had absolute control of the Empire since 1861. Several years ago the elder wife died, leaving the entire control in the hands of her sister, the present Empress-dowager. The latter has governed with great vigor and independence, and is still the most influential personage in the Empire, though, according to Chinese custom and law, both she and the Emperor's father will have to retire to private life when the Emperor assumes personal control of the Government.



The Emperor, being the Son of Heaven and ruler over all earthly things, is furnished with a family modeled after Solomon's, and it is served by an unfortunate class common to all governments of Continental Asia. The court of China, which consists of the Imperial Clan or kinsmen of the Emperor, is shut up within the Imperial or the Carnation, Forbidden City at Peking, and holds no intercourse whatever with foreigners. It has no more to do with foreign diplomats than it would if these diplomats were still living in their own countries, and far less than did the Court of Kublai Khan in the days of Marco Polo. The Censors and great dignitaries of the Empire, and indeed the whole governing class, with the exception of a few such men as Li Hung-Chang, the Tsengs, and Liu Ming-Chuan, Governor-General of Formosa, also hold themselves entirely aloof from foreigners, and as far as possible from foreign ideas. No foreigner has ever seen the Empress-dowager or the young Emperor, except possibly by stealth. No diplomat has ever talked with either of them, and it is not known that any of their own attendants are in any way familiar with western knowledge or the natural sciences, or have any just conception of western civilization and progress. When it is remembered that even the greatest men in the Empire are prohibited from approaching the throne, whether occupied or empty, unless commanded to do so, and then only with their bodies prostrate in the dust, and that the imperial personages hold absolutely no intercourse with ordinary mortals, some idea will be had of the complete isolation and ignorance in which they live. They may be profoundly learned in the philosophy of Confucius, the "Ever-prescient sage," and in the history and

jurisprudence of China, but these pertain to the dead past, and take no cognizance whatever of the affairs of to-day. The court sets the fashion in China as well as elsewhere for the governing class, and as the latter is small (it is said there are only 30,000 office holders in China, over 20,000 of which are Manchus), exclusive and conservative, it cannot be expected to move except as the court moves. It adopts no new ideas, and runs counter to no prejudices of the people or court, and as the people themselves have nothing whatever to say in regard to Government affairs, and indeed nothing to do with them but to pay their taxes, practice "fung shuey," submit to exactions and keep silent, they exert no pressure and have no direct influence upon the Government. No such thing as popular education exists; the people have no common dialect; every province speaks its own tongue, and they are all different from the court or literary language of the country, which is understood by only a few; hence ideas, no matter how important, make their way but slowly, and never from the people upward to the throne.

And yet China as a country has made substantial progress since the beginning of the present century, and especially since the English and French invasion in 1861, and the termination of the Taiping Rebellion in 1863. The influences which have brought about that progress, were first, commerce; second, war and diplomacy; and third, the missionaries. Although the first has been most actively at work, it touches only the maritime cities and provinces, and even these in a modified way. No foreigner ever buys or sells in China. All such work is done by Chinese compradores, while the foreign mer-

chants sit in their counting houses and play the grandee. In the earlier days of commercial intercourse, the Chinese Government undertook to manage trade, and to conduct through superintendents and commissioners all business transactions. It also insisted upon the foreigners doing the same, and set aside places at each of the important ports for their residence. So long, however, as the East India Company had a virtual monopoly of the China trade, as it did up to 1834, the individual merchant, no matter of what nationality, had but a poor chance. In the course of time that trade grew to be so important and profitable that neither the Chinese nor foreign Governments could supervise it closely. Both were, therefore, forced to leave it to the merchants themselves, and this necessarily led to trouble, which was followed by treaties and commercial regulations. The English insisted upon trading where they pleased and in what they pleased, and especially in opium. The Chinese resisted, and this led to wars, in which they were worsted. They were finally, after suffering great loss and humiliation, compelled to legalize the opium trade, and to submit to an *ad valorem* tariff of only five per cent. on all other goods imported from foreign countries. The English also made them pay heavy subsidies in money; and finally, in 1861, an allied army of English and French captured the Taku forts, and marched by Tientsin and Tung Chow to Peking. They drove back the Chinese army, commanded by the Tartar Prince Sankolinsin, drove out the Government, destroyed the summer palace, and exacted a subsidy sufficient to pay the entire expenses of the war. They demonstrated their irresistible power, and convinced the Chinese that it was utterly impossible

for them to stand up successfully against the "foreign devils," but withal they left the principal part of their work undone. They should have insisted upon halting the Imperial Government from its exclusiveness, and compelled it to live in open day, where it could always be got at and treated with upon the great questions of the age. The treaties made at that time required the Emperor to give audience to the foreign ministers, and the poor young fellow, after vainly insisting upon the kotow, did so, but he died of smallpox almost immediately afterwards, and the Government passed again with but a slight interregnum, under the control of his mother and aunt, who have, both collectively and separately, by one means or another, managed ever since to avoid any intercourse whatever with the foreign representatives. It is a fact as instructive as it is curious, that the credentials of all the ministers accredited to the Emperor since 1875 are still in the safes of the various legations. The Emperor has not received them, and evidently does not intend to do so, if he can avoid it. And, of course, he and his Manchu advisers must remain in ignorance of foreign civilization, and the great commercial movements which characterize it, till the barriers which hedge them about are thrown down. While it cannot be denied that foreign wars have opened the eyes of the Chinese to the fact that their Emperor is not Monarch of the World, as they have always made him believe, it is probable that they have studiously concealed the truth from him, and hence he must some day meet with a rude awakening. Just how and when that is to come affords ample ground for speculation, and one man's speculations are about as good as another's.

Before giving mine, I desire to call attention somewhat more fully to the Taiping Rebellion, which was started by a disappointed literary student, who failed to pass his examinations, and afterwards became a religious fanatic. His name was Hung Tse-Chuen, and his fundamental idea seems to have been, *China for the Chinese*, and the substitution of himself for the Manchu dynasty. His success was for awhile phenomenal. Having adopted a sort of Mormon Christianity, and called in an American missionary, the Rev. Issachar Roberts, as his spiritual adviser, the foreigners in China seemed at first to favor his cause. But in the end he became arrogant, and threatened their chief settlement at Shanghai. Concluding that no reliance could be placed on him, the foreigners determined to defend themselves. They organized a company, which they placed under the command of a Yankee sailor from Salem, Massachusetts, who had been first mate on an American ship, but was then out of employment. The foreigners resolved to throw the weight of their influence in favor of the Imperial Government, and this company became the nucleus of the "ever-victorious army," while Ward as its general displayed genius of the highest order in organizing it and leading it to victory. Operating under the general supervision of Li Hung-Chang (now the Great Viceroy), this force, made up of Chinamen but armed with foreign rifles, and commanded by foreign officers, decided the issue in favor of the Manchu dynasty, and overthrew the rebellion. After a remarkable career of two years, Ward was killed at the head of his command, and was succeeded by Burgevine, also an American, but the latter proving insubordinate, was removed, and Captain Gordon, of the

Royal British Engineers, afterwards known to fame as Chinese Gordon, the martyr of Khartoum, was appointed to succeed him. He was an able and gallant officer, and although commonly regarded as cranky, he had the good sense to adopt the methods of Ward, and to complete the work so ably begun by the latter, who is recognized by all who knew him, and especially by well-informed Englishmen, as a very able and very remarkable man. Gordon rendered the Imperial Chinese Government the highest and most valuable services, and was greatly regarded by Li Hung-Chang, the Imperial generalissimo. Without him and his ever-victorious force the Manchu dynasty would have been expelled, and the rebellion would have succeeded. His deeds, his methods and his courage became known throughout the Empire. They were talked about in every city, town and hamlet, and it may be safely said that they did more than all other influences combined to impress the thinking men of the Empire with a sense of their own helplessness and with the fact that the foreigners were superior to themselves in aptitude as well as in the appliances of war.

And so it may be truthfully said that the real awakening of China began at the close of the Allied invasion, and of the Taiping Rebellion. The great men of the Empire were at that time Li Hung-Chang, and the brothers Tseng Quo-Fan and Tseng Quo-Chuan. They were all pure Chinamen, and had learned enough to become liberals in thought and policy. The next great man of the Empire, and by many regarded as the greatest soldier if not the greatest statesman, was Tso Tsung-Tang, who afterwards led the remarkable expedition to Kuldjah. He was also a pure Chinaman, and a great scholar,

but he was a conservative of the conservatives, and would have nothing to do with foreigners except to use their cannon and small arms. He died in 1885, full of years and honors, one of the four Grand Secretaries of the Empire. Indeed he laid claim to priority over Li, but the Throne decided against him, and assigned him to the second place. It is customary in China to retain their great men in the service of the state till their eyes are closed in death, and it is also customary for those men, who in advanced age come to be looked upon as seers and sages, to write a dying memorial to the Throne. That of Tso Tsung-tang is one of the most pathetic messages of the kind known to literature. It begins as follows: "May it please your Majesties! Your Majesties' gracious favor unrequited. Your servant sick unto death utters these valedictory words and implores that the sacred glance may deign to rest thereon!" He then alludes briefly to his bodily ailments, his last furlough, the surrender of his Imperial Commissioner's Seal, and the certainty of his approaching end. He recounts how their servant, "a poor scholar of books," attracted the imperial favor, how he became privy councillor and commander in chief of the army, and humbly adds that "were his corpse to be rolled into an ass's skin he could not claim that he had not received his due." After briefly alluding to the war with the French in Anam, to the aggression of Japan and to the various nations of the earth, "watching around his country like glaring beasts," he points out with the wisdom of a seer, that China will not be able to maintain herself, but will become weaker and weaker. With a cry of anguish he bids her to make a great and united effort to "close the stable



ere the steed be gone," to keep her "mugwort constantly on hand and ready for use," and then in the face of all the prejudices of his life he gives this practical and sensible advice: "Therefore let your majesties out of the deliberations of the high offices in regard to the coast defense come rapidly to a decision. Let railways and mines and the construction of ships and guns be undertaken at once, as a means of insuring our national prosperity and strength. As understanding is at the root of all successful undertakings, let your majesty the Emperor at the same time attend with more and more diligence to the study of our sacred books. Be not remiss even in the smallest matter. Associate daily with men of principle and listen to their counsels. Be sparing in every day life, that there may be a fund for unforeseen circumstances. Let the Emperor and his ministers strive with one accord, in all ways that are right, to do what is right, and your servant will seem in the day of his death to be born again into life.

"With gasping breath and flowing tears your servant humbly speaks these words, which are copied down to be submitted to careful consideration under your Majesty's mirror-like glance."

The significance of this Memorial is that it put the seal of Tso's conservatism and approbation upon what his great and progressive rival had already recommended, but so far it has borne but little if any fruit. The Throne is still surrounded by censors and sycophants, who are loud in the declaration that the occupant of the Dragon Throne, the Son of Heaven, is the fountain-head of all wisdom and virtue, and that he needs no one to tell him what is good and necessary for his Empire. Until



he can be aroused from this complacent but perilous lethargy, and be made to adopt the advice of such statesmen as Li and Tso as the policy of his reign, their words, however wise and statesmanlike, can do no more than familiarize the official class with the great ideas which underlie the prosperity and the progress of the modern world.

The censors are particularly vigilant, and more than once have they, by memorializing the throne and playing upon its ignorance and prejudice, or exaggerating those of the people, put a sudden stop to plans and projects which promised to ameliorate the condition of the Empire. The game of intrigue in which craft is arrayed against craft, money against money, and power against power, is going on all the time, and more than one censor has come to bitter grief by interfering with the plans of the great dignitaries of the Empire, who at a safe distance from Peking know how to silence those who oppose them, and unwittingly let it be found out. Human nature is pretty nearly the same in China as in other despotic countries. While the high and mighty prostrate themselves abjectly before the throne, and dare not so much as lift their eyes in the presence of the awful potentate who sits upon it—albeit he is but a puny and ignorant boy—they do not forget that they are the high and mighty at the seat of their provincial governments, and in turn they lord it over the unfortunate wights who fall under their sway.

But withal China has made substantial progress. The Missionaries, who now penetrate to its remotest recesses, and are permitted everywhere to teach religion, have familiarized the people with the fact that the for-

eigner is not necessarily a public enemy, but is most frequently an intelligent, humane and kindly person. The Missionary hospitals, presided over by competent doctors, never fail to make warm and devoted friends by their merciful ministrations wherever they are established. The number of Christian converts is small, but every Chinaman who comes in contact with foreigners at home or visits a foreign country, no matter how high or how humble his lot in life, becomes to a greater or less degree an advocate of our civilization and an apostle of progress, if not a devotee to our religion.

Commerce has familiarized the Chinese with the superiority of our arts, manufactures and sciences. Everywhere throughout the empire imported needles, thread, cotton cloth, matches, kerosene, and watches are making their way in larger and larger quantities every year. The steamship and steamboat have entirely supplanted the junk for navigating the sea and the great river of the country. And now the China Merchants Steamship Company, with a splendid fleet of vessels, owned and controlled by Chinamen, but all commanded by European and American masters, has as much of a monopoly of the government carrying trade as it dare give it. The canal still carries a part of the tribute rice to Peking, but in a few years that will also be given up to the steamships. This line had its nucleus in the ships built and managed by the great American house of Russell & Company, and during the Franco-Chinese War this house bought the line back and managed it with great success for a year, at the close of which, and when peace had been declared, it was resold to the Chinese Company.

But after all, war has made by far the greatest changes

in China. It has resulted in the organization of a navy, or rather of two fleets, one for the northern and one for the southern coast, composed of English and German built iron-clads of the latest pattern. The northern fleet is under a board of Admiralty composed of the Seventh Prince, the Emperor's father, the Viceroy Li, and Marquis Tseng, but really commanded by Capt. Lang of the British Navy. Arsenals and powder factories, furnished with foreign machinery and superintended by foreign managers, have been established at nearly all of the great cities, and are now engaged in turning out small arms and military munitions of greater or less excellence and in greater or less profusion.

A military telegraph line has been built by the government, aided in a few instances by a native commercial company, from Peking to the northeastern border to Korea, and to all the important maritime cities, and will soon be extended to all the provincial capitals. The construction and operation of the line is controlled by a Dane named Poulsen, and all messages are sent in English. An ingenious system has been devised, by combination of three numerals, by which messages in Chinese can be sent. A military and a naval academy have been established, and are beginning to turn out a few well instructed officers. Ship and dockyards have been located at Taku and Port Arthur for the repair and construction of ships. That at Port Arthur is at the N. E. extremity of the empire across the Gulf of Liaotung. It is badly situated, and has been the subject of much intrigue and contention between native and foreign officials.

A number of foreign instructors, mostly German,

have been employed to drill the troops, quite a lot of American rifles have been bought, and a number of Krupp and Armstrong cannon have been mounted upon the ramparts of the mud forts at the mouths of the principal rivers, but no adequate measures for the organization or administration of the military establishment have yet been adopted. A college for the instruction of advanced Chinese scholars in the western sciences was organized at Peking about twenty years ago, under the patronage of Prince Kung (the fifth brother of the late Emperor Hienfung), and it is presided over by Dr. W. A. P. Martin, of Indiana, and an able body of professors drawn from all countries. It is now full of middle-aged students, drawing instruction therefrom on history, international law and the exact sciences, but just what influence it is exerting in planting the seeds of modern progress no one can yet say. Doubtless its good work will become manifest in due time. Meanwhile it must not be forgotten that the Mandarins who are attending it are in the Imperial city of Peking, surrounded by agents of the censorate, and therefore necessarily on their guard against espionage and misrepresentation. Prince Kung is himself in forced retirement, if not disgrace, the students who were sent to the United States by him at the time of the Burlingame Mission have all been recalled, and are scattered throughout the country in subordinate and irresponsible positions. Many of these young men—they are nearly all young yet—are clever and bright, but they live in a land where youth is regarded as the sure index of immaturity and is deprived of all important part in the affairs of government. A number of them sought me out, and all had the same tale to tell,

the burden of which was—We count for nothing, we are looked down upon by the elders, and have no hope for ourselves or our country so long as the old condition of affairs prevails. They long for railroads, and mines, and furnaces and rolling mills, as the basis for a better order of things, and the man who can give them to China will be its evangelist and regenerator.

Now bear in mind that China is the poorest country in the world in everything except labor and undeveloped natural resources. It has absolutely no floating capital. Every official is afraid of his neighbor, and all are afraid of the government. The legal rate of interest is 37 per cent. per annum and money is never lent in the interior on bond and mortgage, or the best paper at less than 25 per cent per annum. No man is safe from spoliation or from forced subscriptions. The great men are under surveillance and subjugation to the throne, the throne is unapproachable to ordinary mortals, and even to the highest except under conditions and restrictions which are fatal to patriotic impulses and honest purposes. The parasites of the court, who are in daily contact with the Emperor and minister to his wants, necessarily control his mind, and even direct the powers of the government. Superadded to all this is the exclusiveness with which he is hedged about and which separates him from the world, and especially from the world of modern thought. Bear in mind, too, the fact that Chinese philosophy looks to the past and never to the future for wisdom; that only the old is valuable; that change is evil and progress destructive; that the highest questions of state are such as concern the Emperor's personal comfort; that the throne is the centre of all grace, all wisdom, all authority, and

that nothing out of the common run of custom can be legally done by anybody without its special sanction ; and finally, that nobody from the highest to the lowest wants ever to do anything, no matter what its public object or end, unless it shall also be profitable or advantageous to him, and you will begin to have a faint conception of the difficulties to be overcome before railroads can be generally introduced, mines opened, furnaces built and rolling mills erected.

The purchase of foreign iron clads, and the ownership of a fleet of merchant steamships, has rendered it necessary for the Chinese to mine coal in the modern way, and this has caused the construction of a short length of railroad running from the mines at Kaiping to the Peiho river.

When I was in China this road was only 7 miles long, but it ended at a canal which freezes in winter. It has therefore been extended across a barren plain and through a few miserable villages, and will soon form a connection between the mines and the river, as well as between Tientsin and Taku, the principal places on it.

The first section of this road was built surreptitiously, but its extension was formally authorized by the Viceroy Li, doubtless with the implied approval of the government, and under the auspices of the men constituting the China Merchants Steamship Company. Public subscriptions were asked to it from the officials and merchants, but they were not willing to trust a Chinese Company nor each other, and hence did not subscribe for a single share of the stock. The Viceroy and his subordinates have therefore been compelled to furnish all the money so far used. The work is done under the English engineer of the Kaiping Company, and I do

not doubt, so far as controlled by him, has been well and economically done, for he is a gentleman of undoubted ability and honesty. It forms no part of a general system of railroads for the country, and is so located that it can be readily seized and destroyed by any force landing upon the northern coast or invading the country.

This line of railroad is, however, where it can be seen by the Grandees of the Empire, whenever they choose to go to it, and hence it may prove to be some day the exemplar and justification for a more important and useful set of lines; but it is safe to say that before any general system of railroads can be projected and constructed, the whole system of Chinese government must be in a measure regenerated and reconstructed. The imperial treasury is in a chronic state of bankruptcy, and that bankruptcy has become more distressing than ever since the terrible inundations of the Yellow River in Honan and the costly and abortive efforts which have been made to turn it back into its old channel. It is now wandering about in the great plain south of Kai-fongfu, where it has destroyed thousands of villages, and hundreds of thousands of people, but how or where it finds its way into the sea, is not definitely known. The most reasonable supposition is that it runs into the Hungtse Lake, and thence through the lower section of the Grand Canal into the Yangtse-Kiang.

The Empress has followed her own judgment and ordered the breach in the great embankment to be repaired and the waters forced back into their former bed, but all efforts to this end have failed, millions of dollars have been squandered, wasted and stolen, and a number of the great officers connected with the work have been



banished to Ili—Chinese Tartary. This has had a bad effect on the others, and no one dares to make any suggestion, for fear he will at once be charged with carrying it out, and failing in it will also be banished. The government is paralyzed in the presence of this great disaster, and seems at last to have folded its hands in despair. The great Viceroy is sick and growing old, and, besides, has lately been reminded in most unmistakable terms that he is after all only a subject, whose will and wisdom are alike powerless unless the emperor and his guardians approve his measures.

Of course the first, indeed the paramount, need of the empire is that the public treasury shall be replenished, and this can only be done by a thorough rearrangement and reform of its entire fiscal system. Its principal sources of revenue are from the tax on land, from the salt monopoly, from the tax on goods in transit, and from the maritime customs. The tax on goods in transit was a war tax levied during the Taiping rebellion, and is an unmitigated evil which should be abated at once. The land tax, if honestly collected and accounted for, could, according to the best authority, be made to pay four or five times as much as it now yields. The same may be said of the salt monopoly. The Maritime Customs are ably and honestly administered under Sir Robert Hart, and yield with *ad valorem* duties of 5 per cent., about 20,000,000 dollars, clear of all expenses, in Mexican silver annually, and this is nearly all the pure money that ever finds its way into the treasury at Peking. Why such satisfactory results, contrasting as they do with all other fiscal operations in such a remarkable manner, have not induced the Empress or Emperor to also reorganize the other branches of their



fiscal administration, is more than any foreigner can find out. They must do it sooner or later, and when they do it they will also have to recast their whole system of government administration, adopting a set of responsible ministers, instead of the cumbrous boards which they now have. And when the fact is recalled, that these boards are composed of a set of Tartar and a set of Chinese officers to watch and hold each other in check, it will be seen that to break up the system means a revolution, or the masterful hand of a strong and enlightened emperor.

In conclusion, it is worthy of remark that China has been able hitherto to maintain upon her borders a series of dependent or vassal nations, which, whether so designed or not, have acted as buffers against the encroachments of her powerful and aggressive neighbors. But France has occupied Anam and Cochin China; Great Britain has subjugated Burmah and the Shan States, and now threatens to build railroads into Yunnan; Russia has taken all Siberia and vast regions in Central Asia, on the Amur and on the North Pacific Ocean, and is building railroads with wonderful speed across the steppes and arid plains, towards her borders, and now Korea has declared her independence and asserted her complete autonomy. Is not all this ominous of still greater trials and troubles for the Manchu dynasty which controls the destiny of the Chinese Empire? The two great Asiatic Powers are Russia and Great Britain. They have already dominated and divided Central Asia, and all of Western Asia, except Turkey. The tide of population and conquest has turned, and now sweeps irresistibly eastward. The political and commercial necessities of those Great Powers carry them

constantly onward, and they could not draw back if they would from the tasks still before them. They have prolonged themselves side by side to the plateau of Pamir and the heights of Burmese India; Russia has lodged herself firmly on the Amur and the shores of the Pacific as far down as Korea, while England has grasped all the borders of the Indian Ocean. Nothing stays their progress except China, which they now encompass about on every side, in the pathetic words of Tso Tsung-Tang, "like glaring beasts." It looks as though manifest destiny were working itself out in Asia as in America, and would not be satisfied till one or at most two flags float over the whole of that vast continent. Consult any good map, and, after considering the course of history, and the tendency of strong and aggressive nations, irrespective of mere numbers, to absorb the weaker and more inert ones, try to figure out the future of China. Isolation has saved her so far, but in a few years at most her isolation will be a thing of the past. The Marquis Tseng, late Chinese Ambassador to Europe and son of one of the two great brothers, says China is awaking from the slumber of ages. I have shown you that there is some truth in this—but after all, the great question, one of the greatest questions of all time, is will she, can she become thoroughly aroused and armed with the panoply of wealth and progress in time to save herself from the peril which now surrounds her? I do not hesitate to express the opinion that her government, as at present organized and administered, is totally unable to grapple successfully with the great questions which confront it. It is entirely out of date and touch with the living present, and so long as the governing class retains its conservatism and its exclusiveness, and wastes its time

upon the dry husks of a dead civilization, so long must all real and efficient progress and all genuine regeneration remain impossible. What China needs above all things is education in modern arts and sciences, and in modern thought and modern ways of government, not necessarily for the toiling millions but for the governing few. If by any chance the young emperor should turn out to be a strong man, of intellectual stature sufficient to see over the walls which shut out all ideas of the modern world, he might prove to be the saviour of his country, and start it bravely upon the march of progress. If he, or those who have guided him thus far, had the ability to select wise counsellors and to organize an intelligent and responsible cabinet, whose first duty it should be to reorganize and purify the general administration, and especially the fiscal system, the task of regenerating the country and saving it from dismemberment and subjugation, and by the same steps giving it railroads, mines, furnaces, rolling mills, machine shops and manufacturing of all sorts would be a comparatively easy one, but it would still require the constancy and courage of a great and powerful statesman to guide the Chinese government and the Chinese people safely into the harbor of assured peace, prosperity and happiness.

Whatever may be the outcome, it is evident that America has a greater interest in the regeneration of the Empire from within than any other nation. It should therefore keep a close watch on all that takes place there, and when it can do so, properly, it should lend a helping hand. A vast field will open there one of these days for American skill, enterprise and capital, if it be not occupied before by the conquering forces of one or the other of the great Asiatic Powers.

## THE PORTUGUESE IN THE TRACK OF COLUMBUS (1493).<sup>1</sup>

BY DR. P. J. J. VALENTINI.

FROM no one else was it more natural to expect a map of the discoveries made in the New World between the years 1492-1504, than from Columbus, the discoverer himself.

In these twelve years he had sailed four times to the Western Indies. The group of the Antilles and the chief outlines of the Caribbean coast had been first unveiled by him in person.

He could not therefore have been in want of inner prompting, of official invitation or of material for giving some illustrations of the work he had achieved. Nor was he deficient in technical ability, since it is related that for a long time he earned his daily bread in Portugal by drawing maps.

Nevertheless the researches made to find a chart drawn by his own hand, or any accredited copy of such a chart, have been without success, and after endeavoring to ferret out from written history any suggestion of his having ever been really engaged in such kind of work we are led to the conclusion that, in this direction, our expectations are hopeless.

If we begin by making inquiry about this matter of the contemporary writers, we shall find ourselves limited to a single passage of Peter Martyr,<sup>2</sup> in which this stu-

<sup>1</sup> Copyright, 1888, by P. J. J. Valentini.

<sup>2</sup> *Petr. Martyr, Ed. 1574, Dec. 2, Lib. 10, page 200.* In the translation of *R. Eden, London, 1577, on page 92.*

dious chronicler speaks of a Portuguese chart on which he had seen Columbus' discoveries noted. "Columbus also,"—so he writes,—“made the beginning of a similar chart and with the help of his brother Bartholomeo; but the charts made by *Cosa* and *Morales* are the only useful ones.” As to the Portuguese chart mentioned, it has been recently discovered, and will form the subject of our special discussion to follow. The *Cosa*-chart has been in the hands of all students since 1812. But the *Morales*-chart, if such a one ever was separately drawn, appears to have been lost. The passage, as a whole, however, reveals the fact that Columbus must have attempted some such work, yet accomplished nothing of consequence, or worthy of preservation.

If we make inquiry of Columbus himself, we shall find him remarkably silent on this point. Fond of writing as he otherwise is, not one significant word escapes him as to the beginning or the completion of a work which would nowadays appear to us as an almost imperative duty for so successful a discoverer as he was. His reports and letters contain only a few rare and incidental remarks referring to what were then called “*pinturas* and *cartas de marear*.”

Columbus, however, must not be presumed to have been totally unconscious of a duty connected with his vocation as a first explorer. On the contrary, at least at the beginning of his career, he shows himself deeply impressed with such a duty. He has a clear idea of the extraordinary opportunities afforded him, and also of the extraordinary obligations they involved. His ambition is not only that of an impetuous discoverer—he wishes also to outshine all his predecessors in cosmographic

illustrations, and pledges himself to come back with a new map drawn by his hand of the western ocean and the new islands and countries contained therein. A promise so solemn as this he gave, and we may find it at the conclusion of a letter written to his sovereigns, on the eve of his second voyage.<sup>1</sup> It runs thus: "Moreover, Sovereign Princes, besides describing every night the occurrences of the day, and every day those of the preceding night, I intend to draw up a new nautical chart, which shall contain the several parts of the ocean and land, in their proper distinction as the compass shows, and also to compose a book to represent the whole by picture, with latitudes and longitudes. On all which accounts it behooves me to abstain from sleep and make many trials in navigation, which things will demand much labor."

There is no doubt that the first of these promises, to keep the ship's journal with the utmost accuracy, was observed by the Admiral. The original draft made of it on board the ship is lost; perhaps it was destroyed by himself. No matter; this record must have served him for elaborating, soon after his return, an extensive report, a copy of which he sent to the king, who acknowledged its receipt and says that he has read it. At the same time, however, he complains that Columbus has left him without the two charts promised, so that he does not know in what direction by the compass the new islands are to be reached and under what degree they were

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<sup>1</sup> *Navarrete, Col. de viajes, Tom. I. page 1, 2, 3.* These pages contain the "Prólogo" to Columbus's book, which *prólogo* was left unabridged by Las Casas, and in Columbus's original wording; while the following pages, which contain the *Relacion del 1º viaje* are only Las Casas's abstract made from the original text.

found to be situated. It appears that on the first complaint made by the king, Columbus excused himself for not being ready yet. Whether or not the charts were ready on the 5th of Sept., 1493, or delivered between this date of the second request<sup>1</sup> and that of the 25th

<sup>1</sup> Columbus's writings are not of the best Castilian standard, but oftentimes of hybrid wording and syntax. At this place, however, there is not much doubt about what he intends to express. He wishes to work out a complete chart of the discoveries made and to be made, and to present two specimens of the same. The one is to be drawn up in the customary way, that is, to show in what relation the parts stand to the direction of the needle, and from this to prepare one of the so-called compass-charts, as they were furnished by the cosmographers and used by all the mariners of his time. The other specimen was to be an improvement upon the former. Columbus intended to represent the new islands and countries in conformity with their astronomical situation. This new method of map-projection had been often discussed at the court of Portugal, and Columbus had learned how to handle the quadrant and how to compute his longitude from lunar-eclipses by availing himself of the tables of Regiomontanus. It is in this light that we read the passage quoted, to which we should not have paid such close attention, if it had not attracted the notice and study of Mr. Ed. Breusing (see *Zeitschrift f. wiss. Geographie*, Band II., Heft 4, Seite 190, 191). Much as we are indebted to this distinguished scholar for the manifold instruction he has given us and the flood of light he has thrown upon the subject of mediæval navigation, we are sorry not to agree with him on the point he wishes to make in his article, by endeavoring to prove that whenever the Spaniards of the Columbian epoch employ the expression *carta de marear*, they mean by it the written book of sailing instructions. He could not select a passage more unfortunate for countenancing his statement than the one above mentioned. The words: *tengo propuesto de hacer carta nueva de navegar, en la cual situaré toda la mar y tierras del mar Océano, en sus propios lugares, debajo su viento*, express, without leaving any room for doubt, that he had in view to draw a new map, in which their proper situation should be given to the parts of the Ocean, and the whole be made up in the style of the usual compass charts, while the other map was to present itself in the new garb of parallels and meridians (por pintura por latitud del equinoccial y longitud del Occidente). Therefore, the passage shows just the reverse of what Mr. Breusing wanted to prove, and if summed up, contains: 1, the promise to keep the ship's journal; 2, to supersede the old compass-chart containing the sailing directions for the Atlantic islands, by drawing a new one, enriched with the results of the new discoveries to be made; 3, to incorporate the adventures of his voyage into a report (libro), this book to be accompanied, 4, by the illustration of another map, arranged according to meridians and parallels.

For the two letters of the King to Columbus, see *Coleccion de Documentos in-*



Sept., on which he left Spain again, nothing in the correspondence showed, and it is but fair to suppose that on account of the enormous amount of business which pressed upon Columbus during those days, he was unable to finish the chart.

Further on, no mention of any *pintura* or *carta de marear* referring to the second voyage is to be found. Materials for mapping were on the increase. Columbus after this expedition might certainly have drawn up a sketch of a small archipelago. He had discovered considerable new portions of the islands of Cuba and Hayti, the islands of Jamaica and Porto Rico, and the northern chain of the Lesser Antilles.

The picture might have been made still more complete from the results of his third voyage, in which he had looked with wonder at the face of a new continent, when sailing along the tract of coast from the north of the Orinoco River to the Pearl-Islands. It is here we meet for the first and only time with Columbus's personal testimony to the fact that he drew a *pintura* of the new country. In the report to the king on his last achievements, he begs his majesty to be satisfied, for the present, with what he is able to write and with the enclosed picture of the country.<sup>1</sup>

*ditos, Madrid*, 1882, *Tom.* xxxviii., page 221. Barcelona, Agosto 18 . . . "e acordad vos de dejarnos la carta de marear." *Tom.* *id.*, page 240, the Queen to Columbus, Barcelona, Setiembre 5. . . "La Carta de marear que habiades de facer, si es acabada, me enviad luego." The King to Columbus, of the same date, see *Navarrete, C. d. V.*, *Tom.* ii., page 108: "Y porque para bien entender mejor este vuestro libro, habiamos menester saber los grados en que están las Islas y tierra que fallastes y los grados del camino por donde fuistes, por servicio nuestro que nos los enviéis luego; y asimesmo la carta que vos rogamos que nos enviádes antes de vuestra partida, nos enviad luego muy cumplida, y escritos con ella los nombres."

<sup>1</sup> *Navarrete, C. d. V.*, *Tom.* i., page 264: "Entretanto yo enviaré á vuestras Altezas esta escriptura y la pintura de la tierra, y acordarán lo que en ello se deba facer."



Now, if Columbus had resolved to put off his drawing of the new nautical chart to the time after his return from the third voyage, there were strong reasons why he should then have abandoned the whole idea. Juan de la Cosa, one of his former lieutenants, had hastened to anticipate him in such a work. Cosa's large map of the world had just then appeared (1500). The map not only contained Columbus's latest discoveries in the Caribbean Sea, but also Cosa's own explorations as far as the Gulf of Darien. What the jealous heart must have suffered from the publication of this splendid work, appears indirectly indeed, but plainly enough, from a letter of the 21st of August, 1501, written from Granada by Angelo Trevigiano to the patrician Domenico Malapirei in Venice.<sup>1</sup> "Columbus," writes Trevigiano, "is living here in this city poor, in great distress, and has fallen into complete disgrace with the monarch. I have requested him to draw a map of his discoveries for your Excellency. He referred me, however, to Palos, a seaport, where there are people enough that understand such things." We ask, was this curt refusal due to a want of time, to the feeling possibly of not being quite equal in technical training to the work, or to discretion towards his sovereign, or, perhaps, rather to injured pride? More or less, all of these reasons may have worked together. But, if there is still a doubt left in our mind as to what he positively meant by his refusal, his own words will disclose the truth as they stand written in the report he made to the King, dated Jamaica, 7th of July, 1503, after the completion of his fourth and last voyage.

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<sup>1</sup> From *Ab. Placido Zurla: Di Marco Polo ed. a. Viaggiatori Veneziani, Venezia, 1818, Vol. II., page 362, in note.*

"Every tailor's apprentice," he exclaims, "ventures to approach the government now with a petition for a patent of discovery." And in another passage, "One of my crew may now come and tell where the province of Veragua is situated! All they know about it is that they went to a country where there is gold in abundance. The way back no one shall find again; it must be discovered anew." Columbus had imperiously demanded from his sailors their notes, journals and maps. He wanted to keep to himself that "great secret of the province of Veragua." He left no *pintura* or *carta de marcar* of this last voyage. It was only by means of personal recollections, that some old pilots of Columbus were able to re-discover, in 1510, the coast of Veragua, to recognize the harbors and the rivers visited with him before and revive the names he had given them in 1502.<sup>1</sup>

If, therefore, we may no longer count on such good fortune as the finding of a chart, upon which Columbus had noted down his discoveries either separately or all in one general view, we have lately and quite unexpectedly had some compensation for such a loss. Mr. Henry Harrisse, who has for years been working with great success in the department of bibliography of the Columbian epoch, has recently been fortunate enough to hit upon a great treasure. In the library of the Este family of Modena, he succeeded in digging out a large land and sea chart, containing a representation of all the dis-

<sup>1</sup> G. Fernandez de Oviedo y Valdés, *Historia gen. y nat. d. l. Indias*, Madrid, 1851-1857, Vol. II., Lib. xxviii., Cap. 1, page 467; and Herrera, *Hist. gen. d. l. hechos d. l. Castellanos*, Amberes, 1728, Tomo I., Dec. 1, Lib. iii., Cap. 2, page 172: "y dijo un marinero (Gregorio Ginovés) que se quería acordar de un puerto" . . . "y fué loado el marinero de hombre de buena memoria." *Id.*, Cap. 1, page 71 . . . "y lo que mayor dolor les causava era no saber adonde Veragua estava."

coveries made by the Portuguese in the Atlantic ocean down to the year 1502. Mr. HARRISSE has had an exact fac-simile executed of this splendid map and has joined it to his work published on the Corte-Reales. Concerning the original we learn from a letter printed in this work that the chart was made at Lisbon in the year 1502, and at the request of the Duke Hercole di Ferrara, who wished to possess a complete representation of all the discoveries made in the Atlantic ocean down to that year. The letter and the chart show that this was secured for him by a certain Alberto Cantino.<sup>1</sup>

This find is certainly to be regarded as one of the most fortunate that have ever been made in the department of cartography. The map must undoubtedly, as Mr. HARRISSE very justly observes, be looked upon as one of the prototypes of those small and early representations of the New World, for which the Ptolemy Atlases of 1508 and 1513 became so celebrated. The same model was used by Schœner also in the year 1520. It must also be the same of which, as previously mentioned, Pet. Martyr spoke, and of which Am. Vespucci sent a copy to King René as an illustration of his "*Quattuor Navigationes*."

If the Cantino map does not furnish us with anything that is new within the compass of the first discoveries, it has the great advantage of presenting the old things in their authentic original and on the largest scale.

<sup>1</sup> See: *Les Corte-Real*, par M. Henri HARRISSE, in Vol. III. of *Recueil des Voyages et de Documents, pour servir à l'Histoire de la Géographie, Depuis le XIII<sup>e</sup> jusqu'à la fin du XVI<sup>e</sup> siècle*. Publié sous la direction de M. M. C. H. Schefer, membre de l'Institut et Henri Cordier. For description and discussion of the Cantino map, see pages 52, 69-71, 87-90, 215. Compare also in Vol. I., H. HARRISSE, *Jean et Sebastian Cabot*, pages 143-158.

Above all, we are now at last in a condition to examine the long-lost original drawing of that mysterious coast to the west of Cuba, of which the Ptolemies of 1508 and 1513 evidently give us but an imperfect sketch. The names of the rivers, lagoons and places can now be read in their original linguistic purity. In the light of this fact we are now able to study, in a more legitimate way, the often discussed problem, who the "*almirante*" really was, and to which nation, Spanish or Portuguese, he belonged, who between the years 1492 and 1508 succeeded in discovering a coast lying opposite the western cape of Cuba and stretching north as far as to the fiftieth degree. It has remained a puzzle to the students on what authority Ruysch, the editor of the 1508 Ptolemy, relied, when on an extra-sheet containing the first sketch ever drawn of the New Western World, he ventured to represent in the still further West a continental coast inscribed with the legend: *Huc Vsque Naves Ferdinandi Regis Hispaniæ Pervenerunt*. For so far as credit is to be given to written history, it was not till the year 1517 that the Spaniard Cordova discovered in the direction mentioned and at the place described the eastern coast of what is called Yucatan. In an edition of the Ptolemy (1513), the editors took care to present the interesting coast in a somewhat improved form. The scale was larger, the nomenclature more copious, the names themselves were given, not in Latin, as before, but in a kind of hybrid Spanish, and in Gothic type. In the preface was stated, that the original from which the copy had been taken, had been drawn up *per admiralem quondam serenissimi Portugalæ regis Ferdinandi*. This statement was not less anomalous than the foregoing. Columbus had been

the only admiral created by and serving under King Ferdinand of Spain. He had remained unacquainted with the insular character of the island of Cuba, had never visited its western cape nor sailed beyond it to find to the westward a continent reaching to the far north. It were tedious to quote the host of learned disquisitions in which the attempt has been made to conciliate the two contradictory authorities, history and cosmography. No definite result was reached on any one point, either as to the nation which sent cruisers at that time to the west of Cuba, or as to the admiral who made the surveys, or as to the recognition in the mysterious coast of any portion of Central or North America. The names susceptible of interpretation did not afford the slightest suggestion as to the country to which they possibly pertained. But it would be unjust not to mention here the position which Mr. H. Harrisse has taken on the subject. He is the finder and the publisher of the Cantino map, and so far as our knowledge reaches he is also the latest of the critics who have discussed the question. He has brought to this task the whole amount and weight of his vast erudition. As always before, so here, and it is now a pleasure to follow him in his examination of the possibilities in the case, as to the country meant to be represented in the picture laid before our eyes, and the nationality and identity of its discoverer. Despite the mass of older materials at his disposal, and the additional find of the original chart copied by the Ptolemies, the result of Mr. Harrisse's investigation is only a negative one. He concludes that no one of the many navigators who are known to have sailed about those Western shores in those years can be presumed, with any show

of reason, to have been the discoverer. As to the coast itself, he sees in it a representation of the shores of the Mexican gulf, those of the peninsula of Florida, and in continuation those of the United States of America.<sup>1</sup>

This conclusion surprised us, not so much on account of its tenor as for the very abrupt way in which it was stated. We expected Mr. Harrisse to address himself to the examination of the long missing chart with the whole power of his wonted acuteness, to make it speak or yield up its secrets, and after having carefully gathered its utterances, to bind these into the bundle of a compact conclusion. He would thus have afforded to the student an insight into the logic of his statements. This he did not attempt to do. He seems to be almost regardless of the intrinsic importance of his treasure-trove. His eyes are open only to its exterior features. The description of them, indeed, is valuable, but Mr. Harrisse points out no more than would have been detected, upon inspection, by any one else.

We have been brought to regard Mr. Harrisse with feelings of respect and gratitude. The works he has published in the course of now fourteen years abound with new and correct information. He has succeeded in drawing from dry bibliography fresh fountains with which to quench the thirst of the historian and the geographer. His methods of research are exemplary. On

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<sup>1</sup> Mr. Harrisse's words run thus (see *C. Real*, page 87, chap. iv.: "Le littoral descend en une ligne presque perpendiculaire pour aboutir à une péninsule qui s'avance vers l'orient et se termine à la pointe occidentale de l'île de Cuba, dont elle n'est séparée que par une distance d'environ deux degrés. A l'ouest de ladite péninsule, on remarque une large échancrure, comprenant trois golfes. Il est impossible de ne pas reconnaître dans cette échancrure l'entrée du golfe du Mexique, dans cette péninsule la Floride, et dans la côte perpendiculaire le littoral des Etats Unis."

this occasion, however, he disappoints us. He ought to have presented us with reasons more palpable and more conclusive than those he has chosen to give for confining himself to the meagre statement of a merely personal opinion.

If, however, on the one hand, we are disappointed at the incompleteness which marks his examination of the chart, on the other hand we are gratified. He has left to other students an opportunity to complete his work—a chance rarely offered by him, and one which we now attempt to grasp.

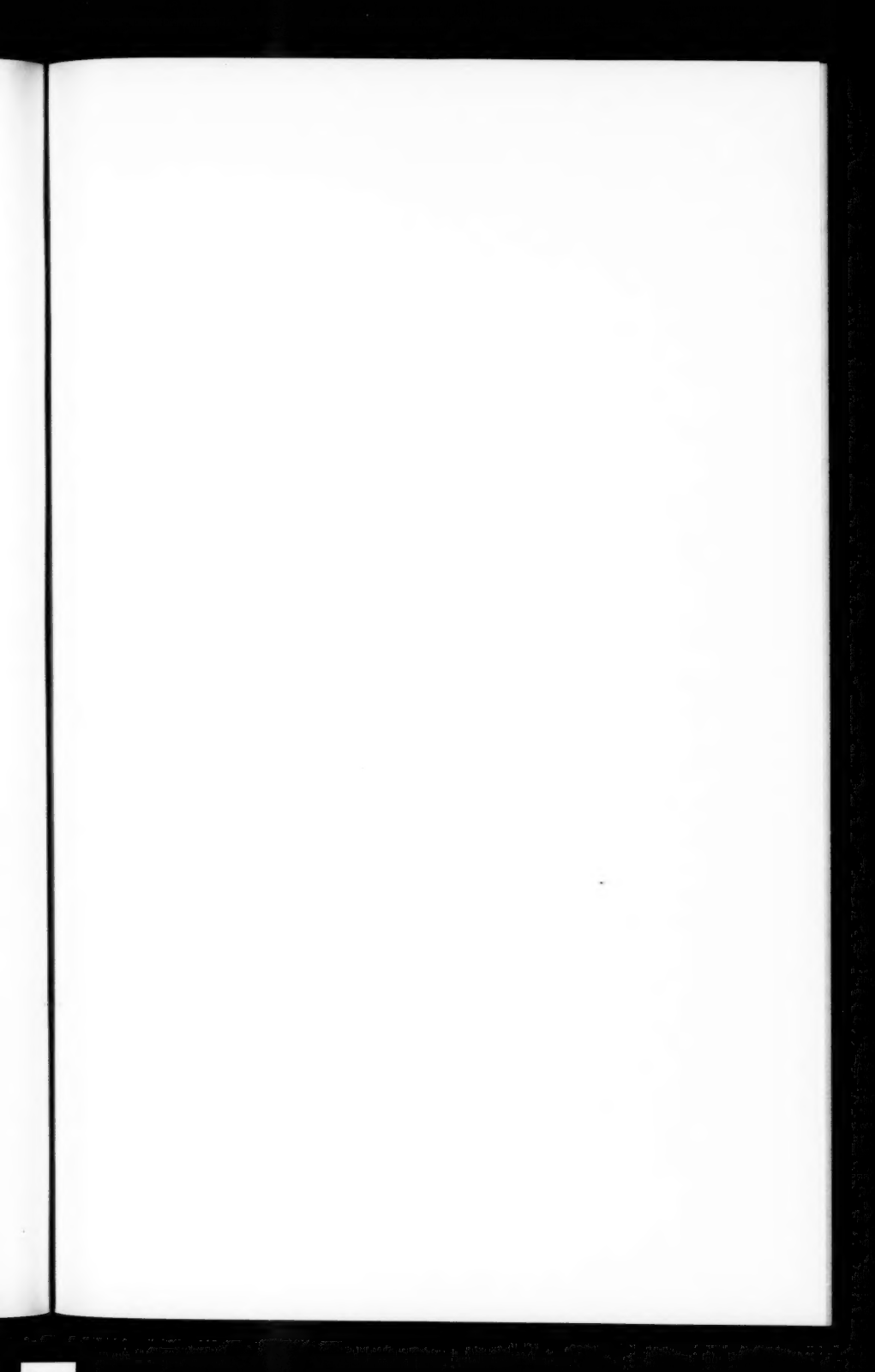
After a close examination of the Cantino map we arrived at a result very different from that reached by Mr. Harrisse. In the coast west of Cuba we discern a representation of the peninsula of Yucatan, the three sides of which, however, the copyist felt compelled, for certain reasons, to straighten out into one single line. Of the twenty-two names, inscribed on the coast, two turn out to be indigenous names of localities well known to this day. Two other names refer to persons, dignitaries of the Portuguese crown. The remaining names are written in Portuguese. A further fact read on the face of the map is that the Portuguese crown kept a naval station in the Antilles, in a carefully concealed spot, undoubtedly to watch the progress of the Spanish discoveries. The reasons for so extraordinary a proceeding will be gathered from the contemporary history of the two kingdoms. The evidence, however, for the fact that the crown of Portugal really dispatched ships to the West Indies, and this immediately after Columbus's return from his first voyage, will be made clear from a correspondence between the King Ferdinand and Columbus.

444 *The Portuguese in the Track of Columbus.*

This is in brief a summary of the points to be discussed in the following pages. Each of these points is to be treated separately, and the story of the Portuguese ships sent out right in the track of Columbus's sailing route shall be first given.

*(To be continued.)*





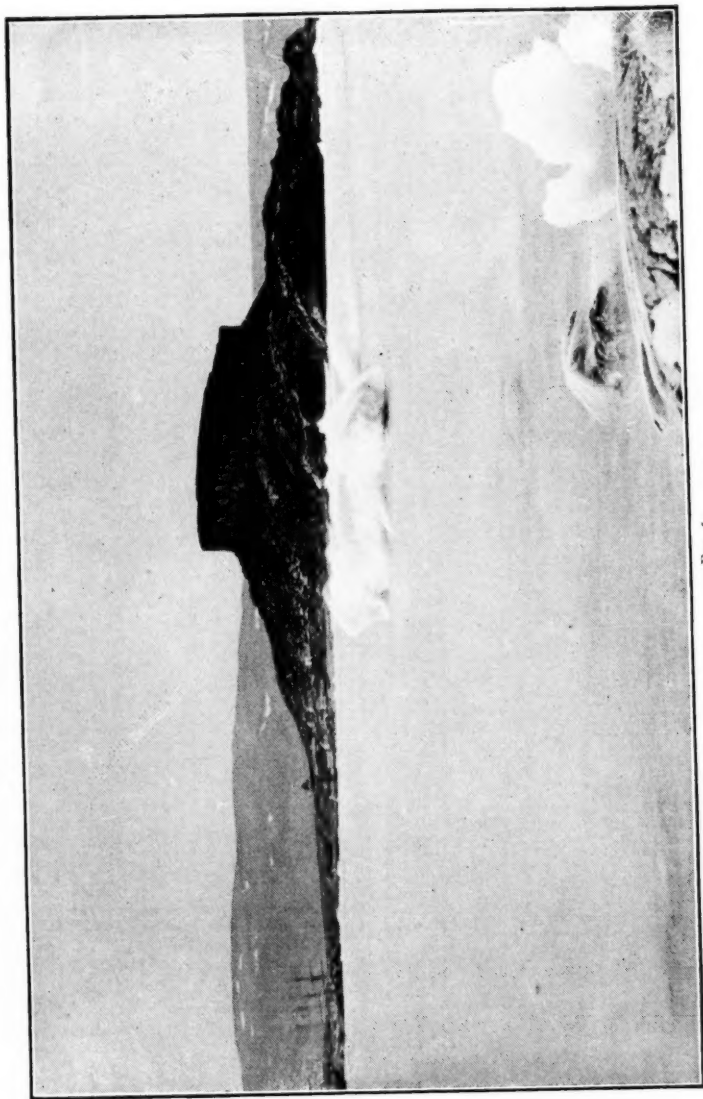


FIG. 6.

LABRADOR, HENLEY HARBOR AND CASTLE ISLAND.

From a Photograph by W. BRADFORD, Esq.

## A SUMMER'S CRUISE TO NORTHERN LABRADOR.

### II. HENLEY HARBOR AND CAPE CHARLES.

BY

ALPHEUS S. PACKARD.

As we entered Henley Harbor the scene was unique. The straits were clear of ice, though a few days earlier the harbor had been packed with it, and remnants were stranded along the shore, or carried hither and thither with the tides. The outlines of some of the pieces were beautiful; many were painted with green tints while the sun was high, but later in the afternoon the greens were succeeded by bright azure blues, contrasting with the almost cobalt blues of the distant Laurentian hills. The entrance to Henley Harbor is very fine, the sea cliffs being over 200 feet high, while behind are the peculiar outlines of the Laurentian gneiss, rising in long swells like whales' backs to a height of perhaps five or six hundred feet. Henley Harbor lies under the lofty, precipitous basaltic cliffs of the Devil's Dining Table, which caps Henley Island. We sail through a fleet of Newfoundland fishermen, whose low, thick masts, strong, clumsy rigging, and ironed and planked hulks—for they were sealers, and had not stopped to doff their ice-armor—contrasted with the beautiful model, slender,

tapering masts and spars of our fleeter craft. Their decks were crowded with men, women and children, dogs and goats, for these people had, like the old Norsemen, brought their families and stock with them for a summer's stay on the coast. Ashore, under the dark, beetling crag, lay the fishing hamlet of Henley Harbor. The houses were small and mean, the flat roofs of some covered with turf, the grass or moss growing on them, while the fish-houses and "stages" were of the meanest description.

After coming to anchor we were boarded by the captain of one of the sealers, a brigantine of perhaps 140 tons burden, lately in from Carbonear in Conception bay. Her bows and also her sides were planked and heavily ironed to resist the ice in the spring-sealing in the Gulf. The captain had, immediately after discharging his cargo of sealskins and blubber—and the smells rising up through the hold and companion-way proved the fact *ad nauseam*—only delayed long enough in port to put in 130 bushels of salt, and then cleared for the Labrador coast without stopping to strip off the outer planking. The captain was an intelligent, stalwart, English-born man only twenty years old, who had been to sea for six years. He was frank and communicative, and in half an hour gave us some insight into the mysteries of fishing and sealing. He had inherited the business, his father having been a sealer for fifty years. He owned the vessel and had brought along a cook; he took, passage free, eleven families, numbering 130 souls, men, women and children, with goats, dogs, cats, and provisions for the whole party, and was to land them at some harbor on the coast north of the straits, where they might

spend the fishing season in their rude summer houses, called "tilts."

During the voyage up the women are stowed aft and in the hold, and in a storm—and when are there two continuously pleasant days on this coast?—the hatches are battened down, the food is handed to them through a hole in the cabin, and then they are left to take care of themselves as best they can until the storm clears off, when the hatches are removed, and the forlorn passengers can take a breath of fresh air.

The captain does not take an active part in the fishing, but makes his profits by charging for freight on the fish. If the season is a good one and his vessel is soon filled, he goes back to Newfoundland and charts more vessels to carry back all the fish which have been caught. The season lasts from the end of June until about the 20th of October.

The season for the seal fishery during the past spring was from March 25th until June 4th. The gulf, of course, was filled with ice, no water being in sight from shore. A successful "catch" of seals is "better than 9000." Each vessel carries fourteen boats, which are piled up on deck; four men man a boat; each man is provided with a gaff or boat-hook and a piece of ratline three and one-half fathoms long. On coming up to where the seals are lying, the crew land on the ice. The sealer runs up to a seal lying near its hole, which may be only a rod or so from the vessel or boat, clubs it—and it is easily stunned and killed with one or two blows—sculps it, then peels off the skin and blubber, leaving the carcass on the ice-floe. Each man can tie up five seal-skins, and drag them to the vessel, and sally out again, rushing

ahead and racing with the other crews of "bloodhounds." The scene is one of excitement and peril, the ice constantly endangering the vessel, which is liable to be "nipped" and founder, leaving the ship-wrecked sealers to burn their vessel and make their way ashore over the ice. One of Mr. Bradford's most successful paintings represents a sealer "nipped" by the ice, the crew abandoning her after having set fire to their vessel, and walking in mournful steps over the ice in the direction of land. The delicate blues of the ice, the sullen neutral tints of the sky, the red glare of the flames breaking out of the burning ship, and the warm tints of the costumes of the men in the foreground, vividly portray a most tragic scene, enacted only too often on the Gulf of St. Lawrence.

To return to our statistics—a "crew" of sealers on the ice is composed of fifty men; each one, if successful, securing five seals. Two hundred and fifty pelts may be brought back after each sally from the vessel. In this way, when the seals are abundant, from 2500 to 3000 sealskins are taken in a single day, 9000 making a cargo. The shares in the enterprise are £60 each man. The captain takes half, "leaving the men in the lurch," as our informant said, which being interpreted means that the men realize little or no profits from the voyage.

A sealskin is worth \$4.00, a full cargo, perhaps, selling in the rough to traders for \$30,000 or \$40,000; the profits on a full cargo are therefore considerable, but the men's "half," being distributed among a large number, does not amount to much for each man. This spring (1864) the seal fishery was a failure.

The young seals are killed by knocking them on the head with a boat-hook or club, and the old ones by shoot-

ing them with heavily loaded old muskets. The hunters make holes in the ice and then watch for their heads to appear above water. Of all the different kinds of seals, the Greenland or harp seal is the most ferocious.

The summer at Henley Harbor was a very backward one; the salmon had not yet appeared at the mouths of the bays and rivers; nor had the cod and their natural food, the capelin, moved in from the deep water. The enormous extent of floe-ice which skirted the coast had lowered the temperature of the sea; at the same time the ice-fields had prevented any icebergs from entering the straits. The prevailing winds were cold and easterly; the cold climate, the strong tides and the three-knot Labrador current passing around the cape into and down the Straits of Belle Isle, render navigation here uncertain and dangerous.

June 27. The light south-easterly wind brought into the straits the fog which had lain all the day previous outside of our harbor, and inland the clouds rested on the hills; the day being dark and lowery. In the morning some of us rowed three miles up to the head of Pitt's Arm, in Temple Bay, a deep fjord penetrating the high gneiss hills, into which pours, over a stony channel, a rapid trout stream about five yards across. The sandy beach was an ancient sea-bottom containing deep-sea shells.<sup>1</sup> On each side of the mouth of the brook were two terraces; on the upper terrace, which was about forty feet above the sea, were two winter houses. I particularly observed the appearance of these houses. One

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<sup>1</sup> The shells were *Buccinum undatum*, a variety with two ribs on the whorls; *Saxicava rugosa*, *Mya uddevallensis*, *Macoma proxima*, *Serripes groenlandica*, *Natica clausa*, of large size, and a branching polyzoon, *Celleporaria surcularis*.



was 21x15 feet in size, the walls of upright, thick boards, the frame of poles; the flat roof was constructed of poles placed near together and covered with birch and hemlock bark, the strips, which were a foot wide, being placed crosswise; the eaves were scarcely five feet above the ground, and the floor was in part of boards and in part of turf. The door, hung on iron hinges, and closed with a wooden latch and string, was only four and a half feet high, and there was a single window, 16x15 inches. Within were three beds and a settle. The lumber for these shanties had evidently, by the piles of sawdust near by, been sawn upon the spot and taken from the Labradorian forest of firs near at hand, which measured twelve inches through at the butt, and were about twenty feet high. In their branches a robin and a sparrow were flitting about. The willow bushes were here five feet in height. On the sides of the sandy terraces were blackberry and raspberry bushes, and currants, shadberries and golden thread just in blossom, while the alders were still in flower.

I dredged in water about fifty fathoms deep, in Chateau Bay, bringing up among molluscs fine large *Leda pernula*, *Astarte banksii*, *Lyonsia arenosa*, *Cardium islandicum*; rare sandstars, and young and old Arctic crabs (*Chionæetes opilio*).

The 28th was almost wintry in its cold, changeable weather. A northeast storm raged, with a few drops of rain and a little snow in the forenoon, while after dinner there was a thick snow storm, the hill-tops being whitened with snow for several hours, which, however, disappeared by the evening. The water in the harbor was intensely cold, and the *Mertensia* and *Clione*, those beautiful creatures of the icy seas, abounded.

The forenoon was spent in examining the trap rocks on the harbor side of Henley Island, and in shore-collecting. The rock-weeds or fuci do not grow luxuriantly on the coast of Labrador, but are stunted and dwarfed, like their more highly-born relatives of the vegetable kingdom ashore. Below tide-mark, however, though the tide on the Labrador coast rises and falls only two or three feet, the Devil's Apron or *Laminaria* is seen, but not so common and large as on the coast of Maine. Life between tide-marks is scanty compared with the New England coast. We never detected the common whelk that gives the purple dye (*Purpura lapillus*); but the two *Littorinas* (*L. rudis*, less commonly *L. littoralis*), were common; these are circumpolar forms, abounding at the water's edge at Greenland.

In this region scarcely a sea-bird was to be seen, and rarely even a gull; but on one occasion three ducks, while a lonely raven flew about the cliff. Insect life was scanty, and with the animals and plants showed in its appearance a strange intermixture of what at home would have been characteristic of early April and late May. Frogs are seen here, we were told: in the garden the turnips were just up.

Thirty years ago there was but a single house at Henley Harbor, and none at Red Bay, where now there are thirty. The fish and birds here, meanwhile, have vastly decreased in numbers. The fish are principally cod, salmon and herring. Old Captain French, our pilot, never saw a hake on the Labrador coast, and only two haddock, though both kinds are abundant and troublesome to cod fishermen at Bay Chaleur, on the New Brunswick shore.

Detained another day by headwinds and rain in the early part of the day, the wind in the evening hauled around to the S.W., giving us a fine evening sky. I dredged in the morning in the rain over the side of the vessel in four fathoms, the bottom rich in the red sea weed (*Ptilota*), the Desmarestia, and the sea-colander (*Agarum turneri*), and besides a portly queer-spined amphipod (*Ampithonotus cataphractus*), which carried its brood of young, also bristling with spines, a fine large *Crangon boreas* with other bright red shrimps came up, with a singular, large, active, leech-like worm (*Pontobdella*) attached; besides a beautiful shell-less mollusc, there occurred a species of *Eolis*, unlike any seen before. In the afternoon we sailed out two or three miles to the mouth of the harbor, and dredged in from ten to twenty fathoms on a hard, pebbly bottom, evidently the continuation of the beach, and showing that the land was formerly at least from 100 to 300 feet higher than at present; besides *Lyonsia arenosa*, *Kennerlia glacialis* and other shells and crustaceans, the interesting *Nebalia bipes* was taken: it was also found in as shallow water as four fathoms. This form is less than half an inch in length and is found throughout the Arctic ocean, is common on the coast of Norway, and its genus is now regarded as the sole existing type of a distinct order (*Phyllocarida*), whose gigantic fossil prototypes, some of them nearly two feet in length, occur in the palæozoic rocks in America and Europe.

The next day also we were wind-bound, but the gale was from the south-west; the wind blew very fresh, having a good sweep over the Gulf, the breakers ran high, as nearly all the harbors in Southern Labrador, *i. e.*, south

and west of Belle Isle, are exposed to gales from this direction. We put out our kedge anchor, and frequently had to haul in a part of the cable to keep the vessel off the rocks. We should have put out to sea and taken advantage of the gale to go on our course up the coast, but were afraid of running upon a sunken rock at the mouth of the "tickle" or narrow passage forming our harbor.

A part of the day was spent about and upon the Devil's Dining Table. This is a mass of columnar basalt, which has been described by Lt. Baddely in the Transactions of the Literary and Historical Society of Quebec for 1829. The height of the rock above the sea is 225 feet, to the base of the pillars of basalt 180 feet; the height of the columns themselves being 25 feet. The columns are quite regularly prismatic, and of nearly the same size and nature as those of the Giant's Causeway.

Ascending the terrace, carpeted with the mountain trident, we climbed up the cliff over the basaltic steps, by the only means of ascent situated on the eastern side, where the columns had been worn away by a little stream, on top of the flat table, which was 125 paces broad at the widest part. The ends of the prismatic columns occasionally protruded through the dense matted covering of curlew-berry or *Empetrum*. The air was cold, chilly, reeking with the sea-drift, and the gale buffeted my face as if a demon were trying to throw me over the cliff, down to the sea-margin of former days.

From the summit of the table the view was an interesting one, though the atmosphere was very hazy. Belle Isle was shut out of sight by a thin bank of fog or thickened vapor which lay on the sea to the eastward. A few

miles up the shore was another cliff of basaltic columns, the bases of the pillars wrapped in snow. There are in this bay eleven sea-terraces which mark the former levels of the sea, eight of which could be seen from the top of this rock. On the west side the terraces slope towards the north, while on Castle Island they slope towards the southwest. The most distinct example of these terraced sea-beaches lay at our feet, forming the western shore of Henley Island (on which the Devil's Dining Table is situated). This magnificent beach rises 180 feet above the sea-level, and when the sea covered it the waves washed the base of the basaltic pillars, as indicated by the debris of broken columns forming the talus at the foot of the cliff on which we stood. This beach is composed of three terraces, and the two lower ones widen out into delta-like expansions on the north-west end of the island, which are free from the usual covering of moss and curlew-berry, and are so distinctly marked with windrows of pebbles and gravels that it would seem as if they had been but yesterday thrown up by the waves.

Greville's Fort,<sup>1</sup> as we may name it, the ruins of which are quite distinct, was built on a broad terrace not far above the sea. On the mainland, north a little east, are three beaches with two terraces, which were beautifully marked, and corresponded with the two lower terraces at our feet, though covered with the rich deep green of the *Empetrum* leaves. Pitt's Arm and Chateau Bay are also terraced, the beaches themselves of unequal size and

<sup>1</sup> According to a writer in *Harper's Magazine* for May, 1861, who describes this fort and gives a plan of it, the fortifications were supposed to have been constructed by the French Canadians, by whom it was abandoned in 1753; another author states that it was built by the Acadians.

height, but the terraces, as we should expect, are of even height throughout, as they mark the former level of the sea. One of the beaches on Chateau Bay was remarkably steep, composed of large, sea-worn boulders, and overhanging like a precipice the winter houses below. Indeed, all along the Straits of Belle Isle from the Mecatinas to this point, wherever there is sand, gravel, or boulders, the sea has, when at higher levels, rearranged and sorted them into terraced beaches or sea-margins. The future geologist who visits this coast will have an interesting task in measuring the heights of these terraces and comparing them with those of Northern Labrador, of Arctic America, of Greenland, and Northern Europe. These beaches are also seen in inland river-courses, and by every pond and lake; they are not, as along the coast of Maine and Massachusetts, concealed by vegetation, bushes or forest growths; but here, owing to the absence of bushes and trees, they were as distinct as if the Labrador peninsula had been upheaved but a year ago. Darwin has studied the formation of the terraces along the coast of South America, where the elevating forces were undoubtedly volcanic, but the nature of the causes which in the northern hemisphere have resulted in the secular elevations and depressions of the land, such as took place during and after the glacial period, is purely conjectural, and belongs to the domain of theoretical geology. To study the causes we must first learn the facts, hence the careful examination of the oscillations of the eastern coast of America from Aspinwall to high polar latitudes is of the first importance. The measurement and comparison of the ancient sea-beaches in a coast like that of Labrador and Arctic

America, where they are so easily perceived, will well repay the labor and time involved.

Robert Chambers's interesting work on the ancient sea-margins of Norway and Sweden gives valuable data for comparison with those of the opposite coast of Labrador, and from the rough observations which have been made it would seem that the oscillations were about the same, both in height above the sea, and in time, on each side of the North Atlantic. I have also seen well-marked terraces in Puget Sound which are beautifully marked, and these should be carefully measured and compared in height with those in the Arctic region and Labrador. It was with no little interest that we observed the old beaches on the Labrador coast, and we shall note their occurrence in the following pages wherever seen.

We remained on the top of the Devil's Dining Table until the sun had set and the darkness began to creep over the scene below. Whether his Satanic Majesty was concerned in the transformation which then came over the scene we will not undertake to say, but as the sun went down the rocks and hills beneath seemed to diminish in height; an undefined, subtle, neutral tint spread over the landscape; a brownish haze due to the vapor in the air came in from the sea and settled over the hills far and near, and as the twilight came on the hills were still more dwarfed in size, when the chill southwest wind from the Gulf, the coldest that blows over this exposed point, sent us back to our vessel, where the thermometer at 8 o'clock in the evening was 44° F.

The fishing hamlet of Henley Harbor consists of a few dwelling-houses, some of them inhabited during the winter, with fish-houses and light wharves here called



"stages." The winter houses are built of thick boards, with flat tarred roofs, the sides of the houses being well battened. The domestic animal here is the dog, Newfoundlanders—seven of them at one house—brought up by the fishermen for the summer: there were no Eskimo dogs or Eskimos at this point, though in the last century they here congregated in hundreds. The fish-houses were rude structures of one low shed, roofed with turf and built on piles, reminding us somewhat of pictures of the ancient pile-dwellings of prehistoric Switzerland.

The fisherman's sail-boat is a ponderous, clumsy affair called a "jack." It is twenty-five or thirty feet long, with not much breadth of beam, rudely built, with short masts, and small sails stained red or black, or with both colors; the oars are of spruce, and very large and heavy, and the stern of the boat is provided with two stakes, such as whalers use for sculling.

I interviewed a Mr. Stone, one of the settlers, regarding the fisheries and hunting at this point, and he gave me the following facts: At the height of the herring fishery in August—and it should be borne in mind that this fish is only a summer visitant, not spawning on the Labrador coast, but passing up, as Hind in his work on the Labrador peninsula states, as far as Hudson's Strait—Stone has caught 200 barrels in a season. He has to pay twelve barrels for a hogshead of salt, the price of which is now (1864) very high. He secures 800 quintals of fish at 18s. a quintal, which amounts to £720 for a successful season's work. He can cure the fish on this coast during the short summer, and is now building a shed for this purpose.

Of salmon 180 quintals are taken in a good season;

they are pickled and sell at the rate of \$5.00 a quintal (112 lbs.), so that he would realize about \$900 from this fishery; but considering that he had a family of ten children, it is not probable that on the average he more than comfortably supports his family, and in many summers the fisheries on this desolate coast are a failure. And to show what little chance there is to retrieve his fortunes by the products of the winter's hunting, he told me that last winter nothing was shot about Chateau Bay from Christmas until the first of February. During the entire winter but a single partridge was shot, while at the same time they were very abundant at Blanc Sablon, showing that possibly these birds are somewhat migratory, going in flocks from one point to another in search of food. There are now neither beaver nor otter, nor silver nor black foxes to be had; only two or three wolves were shot, and two deer. When I asked him what the people would do if the hunting and fishing continued to fall off, he replied hopefully, and in his fisherman's dialect, "Oh, we'll have a spurt by and by." He added that the S.W. wind was in summer "the coldest wind that blows." Winter comes on in November; by the 10th to the 20th of this month the lakes are all frozen over, and by the 20th the harbor is frozen far out into the Straits, while in winter they can go out in sledges on the ice to Belle Isle.

The people here in general were well-mannered, though rough and out-spoken, asking freely of our stores, and commenting as freely on what they considered poor returns in trade.

To return to the Devil's Dining Table, whose geology is interesting; it is a high ovate mass with vertical sides and a flat top, which slightly inclines towards the

southwest, and consists of two layers, showing that the rock is the remains of two separate eruptions, the lower consisting of regular prismatic five-sided columns, each about two feet in diameter, fluted on the sides and curiously worn by transverse impressed lines. The basaltic mass rests upon the upturned edges of strata of Laurentian gneiss which have been penetrated by dikes of syenite. North of the basaltic cap, the underlying rocks are least disturbed, being reddish gneiss-like or foliated syenite, crumbling and quite fissile, dipping at an angle of  $50^{\circ}$  south,  $25^{\circ}$  east; just beyond, this reddish rock runs into the usual dark Laurentian gneiss of the region. Upon submitting a specimen of the basalt to Mr. J. S. Diller, lithologist of the U. S. Geological Survey, he tells me that it is a doleritic basalt.

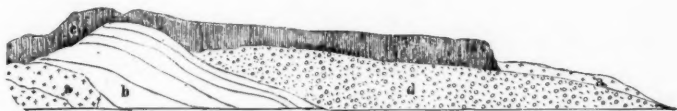


FIG. 5.—Castle Island from the West; *a*, red syenite; *b*, gneiss; *c*, basalt; *d*, raised beach.

At the southeast end of the island, along the shore looking out towards Belle Isle, the flesh-colored syenitic rocks present a rough and broken front to the ceaseless swell of the Atlantic, rising from seventy-five to a hundred feet above the waves, the beetling crags broken and pierced by deep ocean caves; with jutting headlands and little pebbly beaches nestling between them—all the characteristic scenic features of this syenite, whether at Nahant, or Mt. Desert, or on the Labrador coast.

The southern end of Castle Island repeats the geology and scenery of Henley Island, but a little farther

down, away from the sea-cliffs, the syenite and gneiss meet, and seemed splashed together, like two masses of paste or dough which has been stirred up and baked. In places, both rocks were interstratified, dipping north and south in much disturbed strata, but with a general inclination toward the north.

The first of July saw us released from our prison; the day was clear and delightful, and a light southwesterly breeze bore us along a remarkably bold and picturesque coast. About two miles from our harbor is another trap overflow capping and, at the southwest end, concealing from view the syenitic base; at the northern end the basalt is columnar.

We soon came up to our first iceberg, a magnificent pyramid of ice perhaps a hundred and fifty feet high, white as Carrara marble, smooth, as if fresh snow had fallen on it during the past night, lending it a virgin whiteness, here and there brought more clearly into relief by the subtle azure blue reflected from the sea. Across its base ran several suggestive cracks, and though we sailed within two hundred yards of it, it was rather risky, and we remembered Scoresby's stories of the disasters attending the overturning and breaking of floating bergs. Captain Handy, whose life-long experience as a whaler in Arctic regions made him a good judge, remarks as we are passing that a berg will not usually injure a vessel unless a piece of ice falls upon it, but that the waves will swamp a boat. At Resolution Island he rowed past an immense berg, so that it could almost be touched from the boat, saying to himself, "It won't last three weeks;" he had gone scarcely three ship's lengths, when, with a report like the discharge of a park of artil-

lery, it burst into a thousand pieces, many still forming large bergs; the boat was put head-to, and nearly filled with water, but there was no further danger.

Off Cape Charles the coast grows more broken and hummocky, more so than west of Chateau Bay. This is partly owing to the fact that we look directly up into the fjords and bays, and that the headlands run out towards us. We pass Battle Island, a comparatively low land,



FIG. 6.—*A*, Cape Charles, 654 ft. *B*, Hare Island. Entrance to Cape Charles Harbor. *C*, Charles Bay.

with the "ice-loom" or mirage resting over it. We were glad to pass Battle Island Harbor, which has a bad reputation, or, to use an Anglicism, is a "nasty" place. The entrance is very sinuous, the turns short, and the vessel must answer her rudder quickly when going in. Our fishermen enter it late in the season, as "it is a place that holds fish late." Perhaps half of the harbors here



FIG. 7.—Outer Battle Island seen from the Southwest; *A*, Caribou Island.

are unknown, and the fishermen seldom have occasion to enter the innermost ones.

The ice-pack which we were soon to encounter lay north and east of us, with the "ice-blink" over it. We pass Outer Battle Island, and the "Two Sisters," bare, low islands of nearly white gneiss rock. We now sail into the ice-pack, and are gradually surrounded by floes, though they are not near enough to impede our progress.

The shore of Caribou Island—for there are two of this name on the coast—is of a singular pale gray shade from top to bottom. The people ashore, struck by our model and spars, so unlike the other craft on this coast, set the British flag to ascertain our nationality.\*



FIG. 8.—Caribou Island, bearing two miles West.

We pass St. Lewis Bay, a large broad indentation, with its north shore evidently syenitic, as the sea-wall is high, and the rocks rough and fissured, and more broken than lower down; the headlands of syenite probably extend out from the gneiss mainland.

The ice-floes become larger and more hummocky than any we have seen before. A humpback whale now presents a broadside view of himself, with his angular hump, small fin, and as he "sounds," reveals the pale underside of his tail and flukes.



FIG. 9.—Caribou Island, bearing West.

At Spear Point the outline of the coast is very rough; at the entrance to Spear Harbor, which is a shallow bight, there is a high, sugar-loaf island; two black-sailed "jacks" are entering it. Cape St. Francis is a bold, syenitic headland. Over Square Island, which now comes in sight, being fifteen miles ahead, there is a fine mirage, with castle-like, shadowy forms resting on the rock. We are now sailing between the ice-pack and the shore, one nearly as solid in appearance as the other.

The wind is still off shore, but should it change to the eastward the ice would come in upon us and choke up the bays and harbors. Behind us is a pale bluish haze which passes into a well-marked mirage, and as we sail on it raises the higher points of the land beneath, and expands above with weird, strange effects. Beyond us the mirage magnifies the larger floes into huge bergs.



FIG. 10.—North side of Fishing Ship Harbor.

In St. Francis Harbor is a “room” and a “look-out” house; a small bay beyond appears to be filled with ice. The coast at Fishing Ship Harbor is unusually rough and broken, like the waves of a chop-sea; and there appeared to be two terraces at this point, the upper one very high, but whether of gravel or of rock was difficult to distinguish. The wind now became very changeable and baffling, veering from one point to another; and our progress was compared by the Captain to sailing up the Potomac. Passing by perpendicular sea-cliffs, and a bold

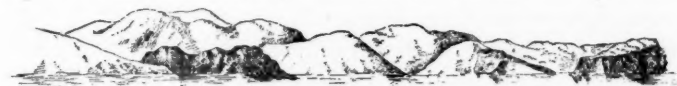


FIG. 11.—Occasional Harbor.

headland on which are dead spruce trees, the rock on the north side of Occasional Harbor changes its character, becoming a gray, Labradoritic syenite, like what we afterwards found on Square Island.

After being for two weeks detained by floe-ice in Square Island, we reached Hopedale July 30th, and after spending a few days with the Moravians and Eskimo, turned our prow homeward, reaching Boston Sept. 4th.



## THE PAST HISTORY OF VULCANO.

BY

PROF. EMILE CHAIX.

GENERAL interest, not unaccompanied in some persons by astonishment, having been awakened by the sudden announcement of the very recent eruptions in the little island of Vulcano, on the northern coast of Sicily, I am induced to present here an outline of its past history, which shows that its volcanic character has been long established.

I must, at the same time, confess that this recent convulsion would have been more ably treated by our fellow-citizen, M. Henry de Saussure.

The Lipari, or Æolian, Islands form a group of seven large and twice as many small islands. All are of volcanic formation, and, taking them as a whole, they offer all the various stages of that formation. Some are quite extinct centres; in others the springs have remained warm, and the fissures, or *fumarole*, are still active vents, from which carbonic acid and steam are ejected; and in others, again, the *fumarole* yield a greater variety of products, such as sulphydric and sulphurous acid, boracic acid and hydro-chloride of ammonia. Stromboli, the most north-easterly of the group, is in a state of incessant activity, with explosions every ten or fifteen minutes; while its nearest neighbor has had, like most

volcanoes, long periods of rest, broken from time to time by paroxysms of renewed energy.

This is now the case with Vulcano. In appearance this is the most forbidding of all the islands. With the exception of a few green patches of recent creation its surface is a mass of bare volcanic rocks of every possible hue, from deep black and vivid red to spotless white. Its steep shores are inaccessible on nearly all sides, and the sternness of its appearance is heightened by the contrast with the lovely green plantations and renowned vineyards of Lipari, which is but a mile beyond it. Vulcano has a superficial area of about 10 square miles, and, according to Fuchs, its highest ridges are 1338 feet above the sea, an elevation nearly equal to that of Stromboli. Notwithstanding its small size, it is geologically extremely interesting, and among its products are the volcanic brown enamel, or glass, called obsidian, pumice, and sulphur, both of old and of later formation, in great quantity; and, though of rare occurrence, boracic acid.

During the Middle Ages, Vulcano passed for an abode of the damned. St. Calogero, the Bishop of Lipari, having charitably banished thither all the fiends from his own bishopric, and forbidden the faithful, on pain of perdition, to approach the island.

Later it was occasionally visited by the more daring for the purpose of collecting a little sulphur and boracic acid, but for a long time the only permanent inhabitants were rabbits. Towards the end of the 18th century, when superstition began to lose some of its terrors, the Neapolitan Government settled two keepers in the place to look after the products. Subsequently, at a

date which I have been unable to fix, an Englishman, or Scotchman, established himself in the island, and planted vineyards, built wine-cellars and a chemical factory and an elegant villa; but these works have all been destroyed and the tenants have abandoned the spot.

It is Herodotus (475 B. C.) who first mentions Vulcano, under the name of Hieræ, as the vent of a subterranean forge of the god Hephæstus, or Vulcan.

Its first eruption is said by Aristotle to have occurred a century later. Other outbursts are mentioned by Strabo, Callias, and Diodorus. We learn from Eusebius that about A. D. 200, a small islet (afterward known as Vulcanello) rose from the bottom of the sea, close to the shore of the larger island, to which it has been united since the year 1550 by an isthmus, mainly composed of ashes. With all these evidences of activity there have been, nevertheless, long intervals of repose in the history of Vulcano. It was visited in the 17th century by an Italian monk, and, in the year 1727, by Dorville, a Dutchman, who was compelled by a sudden eruption to make a hasty retreat from the ridge of the crater. A more successful visit was made just thirty years after by William de Luc, of Geneva.

It was he who first descended into the crater; and to do this he let himself down through a cleft made by the rain in the vertical walls to the depth of 180 feet. Nearly choked by the offensive vapors, he reached the bottom, which was a mass of smoking *fumarole*, and crossed it in its whole diameter of 750 feet.

In 1775 there was an eruption, and the island was still in a disturbed condition when Dolomieu, the famous geologist, made his exploration in 1781. The crater was

completely altered, and the depth was increased from the 180 feet measured by de Luc to more than 1300 feet, which brought the bottom to the level of the sea.

A descent into this gulf was out of the question. Stones dropped from above were received in two basins, which seemed to contain molten sulphur, and the sides of the abyss were coated with the same substance.

Spallanzani was the next observer. His first visit was made in 1788, two years after an eruption, which had so impressed the people that they tried to deter him from making the attempt. He found the crater partly choked up by slag and scoriæ, and yet hot enough to make him glad to step on the projecting masses, which afforded a relief from the burning heat that scorched the soles of his shoes.

He had to guard himself even more carefully against the vapors that issued from a swelling in the centre of the crater; and at night flames rose with the vapors.

From the time of Spallanzani's observations until 1873 and 1874 Vulcano was in the condition of a mere *solfatara*, a little more active than the one near Pozzuoli.

The eruptions which broke its long rest have been described by Prof. Mercalli and carefully studied by Mr. Picone, of Lipari, whose zeal for science has often led him into very serious dangers. The outbreak of 1873 began (like the one of the present year) with a fall of ashes as white as snow. This lasted for a few hours, the accumulation attaining a thickness, on a level, of about one and a half inches. Ink enough has been shed in discussing the origin of this shower to blacken the whole mass. Baltzer, a German naturalist who observed the crater from its edge, in 1874, estimated the depth at

282 feet, and Mr. Picone, in trying to ascertain the depth of the scoriaceous layer, had driven his rod through a bed of pumice, 23 feet thick, when it was suddenly ejected by the bursting out of a new *fumarola*. Other eruptions, principally of smoke and steam, occurred in 1879, 1882 and 1883.

Mr. Picone, who has frequently descended into the crater by night as well as by day, verifies Spallanzani's observation of pale flames issuing from the crevices and the *fumarole*; and he saw, as Dolomieu did, a little pool, 25 feet in length, of molten matter, that spouted up when stones were thrown into it.

The eruption of 1886 destroyed much valuable property, and the inhabitants of the northern part of the island abandoned the place.

Volcanoes are subjected to great alterations. Vulcano, for instance, has had three craters in activity at once, then one, then two, then one again. Its central summit is now formed of a high cone, rising from the middle of an older and lower one (just as Vesuvius rests on the Somma), and with a new smaller cone at the bottom of the present crater.

One feature alone is permanent: a large fissure called Maestro Rosario, held to be unfathomable, and the source of a constant and very powerful ejection of steam.

The fits of wrath of Vulcano being generally followed by long periods of repose, it may be expected that when its roaring voice is once more hushed, the island will again be settled by industrious colonists, heedless of the dangers that lurk in the future.

GENEVA, September, 1888.

## LAKE MISTASSINI.

BY

GEORGE C. HURLBUT.

THIS lake is first mentioned by Father Charles Albanel, S. J., who discovered it in 1672, in his voyage, begun on the Saguenay River and continued beyond the portages across the lake and down Rupert's River to James Bay.

Father Albanel's account is in these words: "On the 18th (June) we entered this great Lake of the Mistassirinins, which is held to be so large that to go round it takes twenty days of fine weather. The Lake takes its name from the rocks that fill it, which are of a prodigious size. There is a number of very beautiful islands with plenty of game and fish of every kind; and elks, bears, caribous, porcupines and beavers are there in abundance. We had already made six leagues through the islands which break it up, when I beheld as it were a height of land from as far off as the eye could reach; and I asked our people if it was towards that place that we were to go? 'Hush!' said our guide to me, 'do not look at it, if thou wouldst not perish.' The Savages of all those regions imagine that whoever wishes to cross this Lake must carefully avoid any curiosity in looking at this course and, in particular, at the place where he is to land; the mere sight of it, they

say, causes the disturbance of the waters and rouses tempests that chill the very boldest with terror." \*

Father Albanel reports no more, and Michaux, who saw the lake in 1792, made no survey.

His account is given by Hind, *Explorations in Labrador, Vol. II.*, pp. 147-148, in the following words :

" Leaving Lake St. John, he ascended the Mistassinni River, or Rivière des Sables, 150 miles long and navigable for canoes to a distance of 120 miles from its mouth. Here he met with a cascade 80 feet in height ; and from the summit of the hills near the cascade, a chain of lakes occupying a long valley leads to the dividing ridge, where a little tributary of Lake Mistassinni takes its rise and forms the canoe route. Early in September the cold on the Height of Land was severe, and snow fell. On the 4th of the month, Michaux arrived at Lake Mistassinni.

" This vast lake, little known except to the servants of the old Nor' West Company, occupies an area between the 71st and 74th degrees of longitude, and beneath the 51st parallel. It discharges itself into Hudson's Bay by

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\* Le 18. nous entrâmes dans ce grand Lac des Mistassiriniens, qu'on tient estre si grand, qu'il faut vingt jours de beau temps pour en faire le tour ; ce Lac tire son nom des rochers dont il est rempli, qui sont d'une prodigieuse grosseur ; il y a quantité de tres-belles Isles, du gibier, et du poisson de toute espece ; les orignaux, les ours, les caribous, le porc-épic, et les castors y sont en abondance. Nous avions déjà fait six lieues au travers des Isles qui l'entrecoupent, quand j'aperçus comme une éminence de terre, d'aussi loin que la vue se peut estendre ; je demanday à nos gens, si c'estoit vers cet endroit qu'il nous falloit aller ?

Tais-toy, me dit nostre guide, ne le regarde point, si tu ne veux perir. Les Sauvages de toutes ces contrées s'imaginent, que quiconque veut traverser ce Lac se doit soigneusement garder de la curiosité de regarder cette route, et principalement le lieu où l'on doit aborder ; son seul aspect, disent-ils, cause l'agitation des eaux, et forme des tempestes qui font transir de frayeur les plus asseurez.

*Relation de la Nouvelle France, en l'Année 1672, p. 49.*

*Relations des Jésuites, Vol. III., Québec, 1858.*

Rupert's River. . . . In Michaux's manuscript notes the following description of the Mistassinni country is given : In the neighborhood of Hudson's Bay and the great Lake Mistassinni, the trees which, some degrees farther south, form the mass of the forest, have almost entirely disappeared in this latitude, in consequence of the severity of the winters and the sterility of the soil. The whole country is cut up by thousands of lakes, and covered with enormous rocks piled one on the top of the other, which are often carpeted with large lichens of a black color, and which increase the sombre aspect of these desert and almost uninhabitable regions. It is in the spaces between the rocks that one finds a few pines (*Pinus rupestris*), which attain an altitude of three feet, and even at this small height show signs of decay. However, 150 miles farther south, this tree acquires a better and stronger growth, but it never rises higher than eight or ten feet." Besides the pine, Michaux mentions the following trees and plants: the dwarf birch (*betula nana*), juniper bushes, wild gooseberries, the Indian tea (*Ledum palustre*), and some species of blackberries. It is only of late years that exploration has been attempted.

The earliest delineation is by Franquelin in his "Carte de la Louisiane ou de Voyages du Sr. de la Salle et des pays qu'il a découverts depuis la Nouvelle France jusqu' au Golfe Mexique les années 1679, 80, 81 et 82, par Jean Baptiste Louis Franquelin, l'an 1684, Paris."

This map is described by Mr. Parkman (*Discovery of the Great West*, pp. 410, 411), and after him by Mr. H. Harrisse, in his *Notes sur la Nouvelle France*, No. 222. The original MS. map was in the Archives of the



Dépôt de la Marine, at Paris, but has disappeared. A copy, made in 1856, is in the Parliament Library at Ottawa. It is to this copy, no doubt, that Mr. E. E. Taché, Ass't Commissioner of Crown Lands, Quebec, refers when he says\* that "it gives a rather imperfect indication of this lake, which he (Franquelin) calls

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\* In the following letter to Mr. Francis A. Stout, of this Society. It is apparently by a slip of the pen that Mr. Taché makes the date of Franquelin's map 1688.

QUEBEC, October 1, 1888.

FRANCIS A. STOUT, ESQ., VICE PRES. "AM. GEO. SOCIETY,"  
29th street, New York City.

Sir:—In answer to your inquiry of the 3d ult., I beg to inform you that the "Great Lake Mistassini," respecting which a number of fanciful articles have lately been published, in certain American and Canadian journals, has been known for a long time, having been discovered in 1672 by the Rev. Père Albanel, S. J. A trading post was established upon it by the French about the end of the seventeenth century.

Franquelin, in his manuscript map of New France, dated 1688, gives a rather imperfect indication of this lake which he calls "Tamagamingue," a name properly belonging to a much less important lake in the neighborhood.

On a map of the region lying between Quebec and Hudson Bay, drawn by the Rev. Père Laure, S. J., in 1731, "Mistassini" is well represented. This manuscript map, which contains very many details and is drawn with great accuracy for the time, forms a part of the archives of the Ministry of Marine at Paris, and is reproduced in the collection of copies made by the late P. L. Morin for the library of the Federal Parliament.

The work of Père Charlevoix includes a map of the geographer Bellin, published in 1744, in which appear all the data given by Père Laure.

These maps, however, not being based upon any regular measurements, cannot be considered very correct. The first geodetic survey of Lake Mistassini was begun in 1873, by Mr. Richardson, of the Geological Commission.

In 1884, Mr. John Bignell, P. L. S., was placed at the head of an important exploring party, with instructions to minutely survey this great lake; but, through difficulties which arose between him and the party in charge of the geological branch of this exploration, he was obliged to abandon the work.

Mr. Lowe afterwards was entrusted with the expedition, and the result of his studies and researches are to be found in the reports of the Geological Commission of the Dominion of Canada for the year 1885.

The French fort called "des Dorval," according to Father Laure, stood at the outlet of "Little Mistassini" into "Great Mistassini." Mr. Bignell, jr., thinks that remains of this fort can be found.

Roberval never was at Lake Mistassini; there is not, at least, any historical record of such fact.

I have the honor to be, Sir,

Your Most Obed't Serv't

E. E. TACHÉ,

Asst. Commr. of Crown Lands.

N. B.—Herewith enclosed, I transmit you a tracing of that part of Father Laure's map indicating Lake Mistassini and the country surrounding.



relating to Lake Mistassini is here reproduced from a tracing courteously furnished by Mr. Taché.

In 1870 Mr. James Richardson, of the Canadian Geological Survey, was charged with the exploration of the country to the northward of Lake St. John. He made a survey of thirty miles along Lake Mistassini; but provisions failed, and he was obliged to leave the work unfinished. It was taken up the following year by Mr. Walter McOuat, who says, in his report :

"We measured on this lake a coast line of about a hundred and fifty miles, including no bays less than a mile in width. The main body of the lake was found to be of a very elongated form. . . . A series of long narrow islands, which were seen only from a distance, extends for many miles . . . . apparently parallel with the longer axis of the lake. We carried our measurements . . . . for about seventy miles from the extreme south-west point. As no land was visible from this position, looking in a north-easterly direction . . . the whole length of the lake cannot be much, if any, less than a hundred miles."

For a surveyor, charged with official duties, Mr. McOuat is less precise than he might be, and Father Albanel's guide himself could not have been more careful to leave things as they were. The dread of the lake tempests seems to have lasted till 1884. In this year an expedition was sent out under Mr. John Bignell, P. L. S., to make :

1st. A thorough survey, hydrographical and topographical, of Lake Mistassini, especially of the northern and eastern portions not examined or surveyed by the Geological Survey parties under Messrs. Richardson and McOuat, in 1870-71.

2nd. A geological examination of the lake shore and of as much of the adjacent country as may be practicable.

3rd. A collection of specimens, vegetable, mineral and animal, illustrating the resources of the region.

This expedition, organized jointly by the Canadian Geological Survey and the Quebec Department of Crown Lands, met with only a partial success, Mr. John Bignell having been unable, "on account of some unfortunate misunderstanding, to carry out more than a certain part of the duty which had been assigned to him."\* In his detailed report to the Commissioner, Mr. Bignell is silent on the subject of the misunderstanding.

He arrived with his party at the Little Mistassini on the 13th December and, continuing down the lake till the 19th, sent two Indians ahead to the Hudson Bay Co's Post for supplies. These men were met returning on the 21st.

On the 23d the party was met, when a few miles from the Post, by Mr. Wm. Miller, the gentleman in charge, attended by a number of his employees. The Post is a cluster of four or five buildings, including the Co's store. Here Mr. Miller has resided with his wife and family for a number of years, in a house furnished with the comforts of civilized life; and at the time of Mr. Bignell's visit, he was about erecting a small chapel. Some of his employees are also married men. The Post is supplied from Rupert's House on James Bay, to which Mr. Miller makes a visit once a year in June, with the furs that have been collected.

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\* Report of the Commissioner of Crown Lands of the Province of Quebec for the twelve months ended 30th June, 1885.

According to Mr. Bignell, good potatoes and other vegetables are raised, although the land has been cropped over and over again for many years, without ever having been enriched.

The Eskimo dogs, of which there are many at the Post, are employed in the winter for drawing the year's supply of wood for fuel, and in visiting the nets, some of which are set at a distance. These dogs are fed on fish in the winter, and in the summer forage for themselves.

The temperature at Mistassini runs to extremes. The thermometer often marks  $50^{\circ}$  or  $60^{\circ}$  below zero (Fah.) in winter, but the air is very dry. The snow-fall is heavy and ice forms to the depth of six feet. The bays are frozen in October or November; the great lake not till January, and the ice breaks up at the end of May or the middle of June. The summers are very hot, with frequent thunder-storms.

Fur-bearing animals, particularly beaver, otter, marten and black bear, are numerous; and the lakes abound with trout, jackfish, whitefish, pickerel, carp, and the "maria," a fish resembling the cod.

He visited the Marble Cave, marked on Father Laure's map, and found that it contained two rooms, the outer one about 18 ft. wide and 16 deep, with a roof 8 ft. high, the inner one 10 ft. deep, 8 ft. wide and 6 ft. high. The walls were of spar.

Mr. Bignell remained for several weeks at the Hudson Bay Co's Post, at Mistassini; and he makes the following remarkable statements as to the size of the Lake: "A very intelligent Indian, to whom I spoke on the subject, told me that some years ago he had met with an old Indian who informed him that from what he

knew, and from what he had heard, he thought that a good walker, carrying nothing but what he required for the trip, could in the spring, on the crust, go from end to end of the Lake in ten days. Now under these circumstances, as fifty or sixty miles per day would be considered but moderate, we may form an approximate idea of the extent of this Lake, and if we accept only half of this estimate, we may still call the Lake an immense one. The general opinion was that it could not be scaled around in less than one summer."

Mr. Bignell's faith is worthy of Sancho Panza's friend: "And he who told me this declared that it was so true that I might swear I myself had seen it." Stronger testimony could not be; but the Commissioner of Crown Lands accepts as final the plan of the Grand Lake Mistassini prepared by Mr. Low, of the Geological Survey.

"As I anticipated," says the Commissioner, "this sheet of water is not of the extraordinary dimensions assigned to it by certain parties from the exaggerated accounts which had reached them. Its extreme length is not more than ninety-five miles, nor its greatest breadth more than fifteen." If the "certain parties" are the intelligent Indian and Mr. Bignell, they have a grievance; for the document, which records their belief in the immensity of the Lake, is printed without correction as Appendix No. 38 to the Report of the Commissioner.

Mr. A. P. Low, B. Ap. Sc., who made the survey of Mistassini, was at first charged with the geological portion of the joint exploration. He tells, in his Report to the Director of the Geological and Natural History Survey,\* that, while at the Hudson Bay Co.'s Post, he

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\* Part D, Annual Report, 1885.

had several disagreements with Mr. Bignell and found it necessary to go to Ottawa. He returned with instructions to take charge of the party. He began his survey where Mr. McOuat had left off on the west side, continued it to the north end and thence back down the east side, "connecting again with McOuat's survey at the Big Narrows," at the upper end of Abatagush Bay. The distances were measured with a Rochon micrometer, the angles with a transit theodolite, and frequent observations for latitude were made with the sextant as a check on the scaling. The work was done in nineteen days.

Mr. Low's report must be accepted, though it does not meet the requirements of a "thorough survey, hydrographical and topographical." The Lake is described as a long and narrow body of water stretching from N.E. to S.W., with a perceptible curve between the ends, the concavity of the curve being toward the S.E. It lies between N. Lat.  $50^{\circ}$  and  $51^{\circ} 24'$ , W. Long.  $72^{\circ} 45'$  to  $74^{\circ} 20'$ .

The length is said to be *nearly* one hundred miles. At one place the Lake is very deep, "an isolated sounding, made in crossing, having given 374 feet at a point which, *I was informed*, was not the deepest part of the Lake."

Poonichaun Bay,\* which lies W. of Abatagush Bay, "continues in a south-westerly course for a long distance, *as the end was not reached* after ascending it fourteen miles. *The Indians say that a large river empties into the Lake at the head of this bay.*"

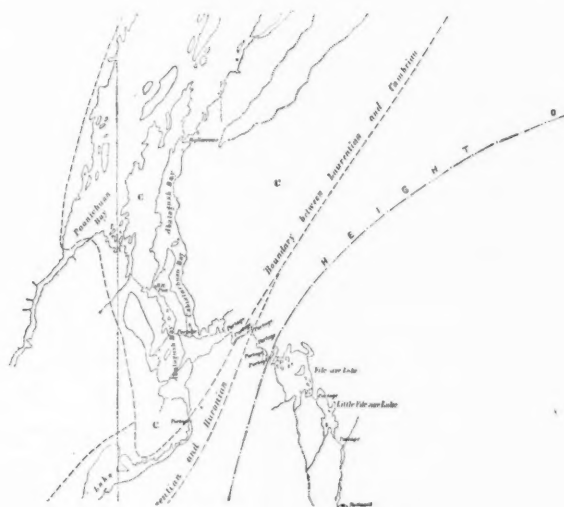
The italicized expressions do not inspire confidence

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\* Spelled Poonichuan on the Map.

in the results of Mr. Low's exploration; and there is work yet to be done before a true map of Lake Mistassini can be made.

That so little has been known of the Lake is the more surprising, seeing that the Hudson Bay Company have



LOWER END OF LAKE MISTASSINI.

From the Map in the Report of the Geological and Natural History Survey of Canada. Part D., 1865.

had a trading post on its shores for over one hundred years. "This post," says Mr. Low, "was first situated near the outlet, but owing to the difficulty in procuring an adequate supply of fish, the staple article of food, the post was removed, over fifty years ago, to its present position on the south-east bay. During the time of the North-west Trading Company, they also had a trading



post at the southern end of the south-east bay."\* As to the climate Mr. Low says, on p. 16 of his Report, that the summer is shorter and colder on the main body of the lake than in the vicinity of the post. Where the trees were at all dense the low lands bordering the lake were frozen solid within a foot of the surface during the month of July. The Hudson Bay Post is the best point for agriculture, and here a poor crop of potatoes is raised yearly, the tops being always frozen before they mature. In the spring, as soon as the frost was out of the ground, Mr. Low sowed garden peas, beans, corn and turnips. On August 20th the peas were beginning to fill the pods, the beans were in flower, and the corn was eighteen inches above the ground; the turnips alone were growing nicely.

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\* *Geological and Natural History Survey of Canada*, p. 13, *Part D, Annual Report*, 1885.

## THE PHILOSOPHY OF GLACIER MOTION.

BY

PROF. WM. LUTTRELL ROGERS, M.S.

HAVING described the development of snow into ice that takes place in the *névé* of a glacier, Prof. James Geikie goes on to say : "Thus solidified and apparently rigid, one would at first suppose that hardened snow or ice would be as immovable as the rock of the mountain upon which it reclined. We know that a bed of tough clay will rest upon a considerable slope without sliding downward, and even the loose stones and *débris* which cover so many hillsides in a highland country find repose upon an incline of  $30^{\circ}$ . At Fourneaux the *débris* shot from the mouth of the great Cenis tunnel forms a still steeper slope. Mr. Whympers tells us that its faces have as nearly as possible an angle of  $45^{\circ}$ . But ice, which is a much more rigid body than even the hardest clay, will move upon a slope that is inappreciable to the eye."\*

Prof. Croll, in criticising Tyndall's *Regelation Theory*, also says in this connection : "I presume that few who have given much thought to the subject of glacier-motion have not had some slight misgivings in regard to the commonly received theory. There are some facts which I never could harmonize with this theory. For example, boulder clay is a far looser substance than ice ; its shearing force must be very much less than that of

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\* "The Great Ice Age," pp. 32, 33.

ice, yet immense masses of boulder clay will lie immovable for ages on the slope of a hill so steep that one can hardly venture to climb it; while a glacier will come crawling down a valley which by the eye we could hardly detect to be actually off the level."\* It seems strange that such eminent glacialists as Geikie and Croll should compare "a bed of tough clay" or the loose stones and débris which cover so many hillsides, *in their inert state*, with the incessantly moving glacier. Both, to be sure, rest upon an inclined bed; but here the analogy ceases. The boulder clay or the rocky débris represent in the economy of nature lifeless, functionless organisms—those that have already fulfilled their mission, or else at most are endowed with potential energy from past activity. How different with glaciers! Stretching up into that region where the fall of snow during the year is largely in excess of that disposed of by evaporation or the occasional discharge of an avalanche, glaciers constitute one of the great links in the circulation of meteoric waters. The glacier then, unlike the débris or recumbent bed of clay, has its function—that of relieving the excess of snow and preventing an indefinite accumulation of the waters of the earth in their solid state upon the domes of the continents. Thus the glacier has its origin in, and is maintained by, this region of falling and fallen snow, its fountain head. Here, then, first of all, we should look for the cause of its motion. Geikie and Croll in the above statements evidently had regard only to the glacier proper, the "*glacier d'écoulement*" of Rendu, ignoring the névé or "*glacier réservoir*." As well, however, enter into the discussion of the philosophy of

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\* "Climate and Time," p. 497.

a river's motion and overlook entirely its source, as to inquire rationally into the motion of a glacier without due regard to its *névé*. Did the Mer de Glace, from its terminus at the sources of the Arveiron to its junction with its tributaries at Treleport, rest as at present upon its mountain bed, and all wasting away, from some conjunction of physical causes, were at an end, then I contend even were it upon as steep a slope as the clay or rubble it would remain as immovable as they *under like conditions*. But of course, because of the physical properties of ice, these conditions could never be realized in nature. Let us then look at the matter from the opposite standpoint. Did the beds of clay and heaps of rubble exist under like conditions to the glacier, even upon far gentler slopes than those mentioned in the opening quotations, they would move and frequently have moved with frightful rapidity, carrying wide-spread devastation in their wake. The "mass of chalk on the Dorsetshire coast," that in 1839 "slipped over a bed of clay into the sea," and the "thousands of tons of solid rock" that in the rainy summer of 1806, "suddenly swept across the valley of Goldau, burying four villages with about 500 of their inhabitants,"\* will bear witness to this statement. Let, then, the heaps of "loose stones" receive constantly fresh accessions from the mountain-sides higher up, and the inertia of the mass will be overcome, its potential will be translated into an intense kinetic energy, and the entire mass, as it thunders down as an avalanche, will perform its function by relieving the mountain of its own wreck. Or let the clay have the cohesion of its constituent particles overcome by saturation from percolating waters,

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\* Encyclopædia Britannica, Geology.

and the attachment of its bottom weakened by the undermining and lubrication of underground waters, and the entire mass will be precipitated as a land slip. Both these conditions in a modified form would seem to exist in the glacier. The cohesion of its particles must become weakened by a partial melting; its bed must become lubricated by the streams of water that come from the melting of its surface, while the falling flakes of snow, that by their aggregate weight first urged the glacier down the mountain-side, must help maintain its motion. Tyndall long since pointed out this analogy between *moving* earth and moving ice. In speaking of the curves that sweep across some glaciers on the union of transverse with marginal crevasses, he goes on to say: "In land slips, and in the motion of partially indurated mud, you may sometimes notice appearances similar to those exhibited by the ice."\* The discussion of the physical cause of glacier-motion would seem upon analysis to have reached the following stage of development: 1. It has been proved again and again by most accurate experiments that, independently of its motion as a whole, the glacier experiences a differential motion—a motion of *certain* of its constituent portions relatively to others: and further the same experiments have accurately defined just where the planes of swiftest motion lie, but it yet remains to be *conclusively* shown *just* what these portions are, their nature, size, and physical properties. 2. From all the known phenomena of glacier-motion there would seem to be two, and only two, of nature's great powers concerned in it—gravitation and heat. But it yet remains to be *conclusively* shown in *just* what way these

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\* "The Forms of Water," pp. 108-9.

forces act. He who can give answers to these two questions so correct that they will harmonize perfectly with each other and with all the known phenomena of glaciers and the laws defining their motion, will undoubtedly solve that problem which, up to the present time, has proved to be the most vexed in all physical science. It was the endeavor to do this satisfactorily that has led the most of our great geologists to formulate their now celebrated theories of glacier-motion. Let me, in a brief résumé, notice the most prominent of these.

After it became known that glaciers move—which was not until the eighteenth century—the most natural supposition of the early and superficial observer would be that they bodily slide over their beds as a slate would from a roof. Altman and Grüner, in 1760, were the first to formally propound this "*sliding*" theory, which was afterwards revived, in 1799, by the distinguished traveller and investigator, De Saussure.\* In our own days Hopkins has so far modified this theory as to hold that it is the huge sections, into which the glacier seems to be divided by crevasses, that experience downward motion.

So early as 1773, Bordier of Geneva seemed to be struck by certain general resemblances between the motion of a glacier and that of a river, and held that "the entire mass of ice is connected together, and presses from above downwards, after the manner of fluids," and that glacier-ice was like "softened wax, flexible and ductile to a certain point."† In 1841, Rendu, the learned Bishop of Savoy, independently advanced similar views,

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\* "*Voyages*," tome II.

† "*Picturesque Journey to the Glaciers of Savoy*."

much more elaborate, however, as to detail. For he held that in glaciers, as in rivers, "the friction of the bottom and of the sides . . . causes the motion to vary, and" that "only towards the middle of the surface do we obtain the full motion." And further, that "glacier ice enjoys a kind of ductility which enables it to mould itself to its locality . . . as if it were a soft paste."\* Unfortunately, he had no exact measurements by which to verify his predictions. It was left for the celebrated glacialist Forbes, the following year, to apply a crucial test of Rendu's generalizations, and his own, with the aid of the theodolite. He then conceived the idea that "a glacier is an imperfect fluid, or viscous body, which is urged down slopes of certain inclination by the natural pressure of its parts;" and that the molecules of ice must move over and past each other in their downward flow as those of water do in a river. Such is the substance of his well-known "viscous" theory.

Recent investigations have shown an undoubted viscosity in ice, especially snow-ice. Helmholtz made an extended series of experiments showing that snow can be changed into ice by pressure, and that crushed ice can be moulded into almost any form. Herr Pfaff of Erlangen later made investigations in the same direction. Tyndall had attributed apparent viscosity in ice when under pressure to crushing and regelation. Bianconi of Bologna declared that while Tyndall's experiments showed that such might be the case where the changes of form took place *rapidly*, they did not preclude the possibility of ice possessing a small amount of viscosity. He conducted a series of experiments in 1871 on plates and bars of ice

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\* "Théorie des Glaciers de la Savoie."

submitted to bending and torsion. These experiments showed conclusively, that *slow* changes in form in ice can occur without any crushing and regelation, although the slightest jar during bending would shatter the ice-plates. Furthermore the lower or convex side of the bending plate, as Prof. Joseph Leconte has pointed out, can experience neither crushing nor regelation, as it is under tension, not pressure. Afterwards Messrs Mathews, Mosely, Tyndall, and Heim obtained similar results. Prof. Bianconi and Heim further ascertained that granite pebbles and iron plates when slowly pressed into ice penetrated it as they would a viscous mass, the displaced particles of ice rising in a fringe about the intruding body. To preclude all possibility of regelation coming into play, Mr. Hungerford recently experimented with snow and ice under pressure, at a temperature ranging from  $25^{\circ}$  to  $9^{\circ}$  above  $0^{\circ}$  F. and obtained results similar to Bianconi's. All this points to a certain plasticity in ice, whether this plasticity be concerned in the glacier's motion or not.

Faraday long ago showed that two pieces of ice on being brought together would cohere or *regelate* at the points of contact. Tyndall calling attention to this property of ice holds in his well-known *regelation* theory, that it is the discrete particles of the glacier which experience differential motion, having first been separated from the parent mass under strain, moved downwards on momentary relief of pressure, and finally regelated under renewed pressure by the constantly acting force of gravitation. Croll, struck by the fact that ice is diathermanous, concluded that the only way heat could pass through it would be by successive molecular melt-



ings on the approach of the heat ray and resolidifications after its passage, the molecule of water giving out nearly the same amount of thermal energy that the molecule of ice had absorbed. In its liquid state the molecule occupying less space, and hence having room to move, would under the force of gravitation seek a lower level, there to resolidify and act as an entering wedge between adjacent molecules of ice. As glaciers must be penetrated by heat rays in all directions, Croll\* concluded that the sum total of all such molecular transformations must constitute the distinct downward motion of the glacier. Such in brief is his *Molecular* theory.

Carnot observed that pressure lowers the freezing point of water, and Prof. James Thompson found by experiment that this amounted to  $0.0075^{\circ}$  C. for every atmosphere of pressure. The latter held† in his *Pressure-liquefaction* theory, based on this experiment, that the portions of a glacier at any instant, subjected to enormous but slowly applied pressure, would first liquefy, move downwards, and then resolidify, the pressure meanwhile being transferred to new portions.

The earliest theory to be advanced, as far as is known, was by Scheuchzen of Zurich, in 1705. He thought that the motion of a glacier must result from the expansion, at the moment of freezing, of the water in the body of the glacier, which percolated there through innumerable capillary fissures, from the melting surface above. J. de Charpentier of Bex, in 1841,‡ again brought forward the same hypothesis, and so far elaborated it that it is now

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\* "Climate and Time."

† "Proceedings of the Royal Society," May, 1857.

‡ "Essai sur les Glaciers," pp. 14, 103.

known as Charpentier's *Dilation* theory. L. Agassiz held the same views until he found\* by experiment that the body of the glacier could not be the store-house of intense cold it was supposed to be, since, according to his results, it has a mean temperature of 32°F., whether that of the surrounding air range far above or below this. M. Forel questions these results, however, as we shall see later. Canon Mosely observed† that sheets of lead, when placed upon an inclined plane of too gentle a gradient to be affected by gravitation alone, moved downward when subjected to changes of temperature. He attributed this phenomenon to the superadded action of gravitation tending to lower the centre of gravity of the sheets by always favoring the downward movement—of the upper end when they contract, of the lower end when they expand. This experiment was the basis of his modified form of the dilation theory.

Fr. Jos. Hugi, the distinguished naturalist of Soleure, was the first to describe the granules of glacier-ice,‡ which he designated by the name "*cristaux du glacier*," and the first to advance the *Granular-dilation* theory of glacier-motion. He recognized the fact that the granules increase in size from the névé downward, and to the expansion force resulting from this growth he attributed the progress of the glacier. Ch. Grad later held similar views,§ and within the last few years Forel of Morges, has adopted and elaborated their generalizations in an article entitled "*Le Grain du Glacier*." || The nature of

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\* "*Nouvelles Recherches*," 1847.

† "*Proceedings of the Bristol Naturalists' Society*" (1869)

‡ "*Naturhistorische Alpenreise*," p. 341.

§ "*Les Mondes*," tome 35.

|| "*Archives des Sciences*," tome 7 (1882).

this granular growth, according to their hypotheses, is described by Forel in the same article: "It is the molecular affinity which causes the crystal to increase in the mother water, in which it is plunged. The crystal is placed under such conditions that it must increase in volume; it is bathed by the water at zero, which becomes colder; this water cannot part with its heat without changing its state, when it passes into the state of ice; this ice under the action of molecular forces, adds itself in new layers, in the same planes of crystallization, upon the periphery of the parent (*l'ancien*) granule. The crystalline granule increases in volume."\* Prof. Arnold Guyot, the great Swiss savant, also refers to the part the granules of the glacier play in its motion. "Glacier ice, however, never loses the traces of its origin, but a blow of the hammer will cause it to crumble to pieces and reveal its granular structure."†

Such are the principal theories that have been advanced, stated as briefly as is consistent with accuracy, and without any reference to the warm and often protracted discussions that followed the presentation of some of them, notably Forbes's and Tyndall's.

I will now assume with Hugi, Grad, and Guyot, that it is the component granules of the glacier that experience differential motion, and then deduce from the laws and phenomena of glaciers the part, it seems to me, heat and gravitation must play in this motion. I have endeavored to show in the opening paragraphs of this article that it is of vital importance in this discussion to consider most carefully the forces at play at the

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\* "Archives des Sciences," tome 7, p. 351.

† "Physical Geography," p. 94.

source of the glacier. Let us then take as a typical glacier the Mer de Glace, and have regard to its principal source at the base of the Aiguille du Géant. The famous Col du Géant here constitutes the vast amphitheatre where year after year is collected the snow that falls upon its surface, and that which is shed from the rocky pinnacle which gives it its name. As the atmosphere of the Alps is moisture-laden, the snow-falls are in consequence large, and the waste by evaporation comparatively small, since the rays of the sun must often be screened off from the surface of the snow by clouds. The necessity then for some competent form of relief of the ever-accumulating mass of snow becomes patent, as the occasional discharges by avalanches are impotent to effect it.

The architecture of these vast beds of snow is clearly delineated at such points where a crevasse or bergschrunde exposes to view a natural section. Here the snow has been observed by Tyndall and many other investigators to be distinctly laminated, every pair of delicate blue bands traced along the snowy white mass defining the snow-fall for a given year. During the winter months the snow-fall is very large and of a dry, powdery nature. During the summer months it is small and of a moist, heavy nature, while the moisture is largely precipitated as fogs, mist and rain. In consequence, the snows of winter are gradually compacted and consolidated in summer by their superincumbent weight, aided by the various forms of precipitated waters and that which comes from the melting of the snow itself.

Prof. Tyndall has given the rationale of this process

of transformation of snow into ice. "At its origin, then, a glacier is snow—at its lower extremity it is ice. The blue blocks that arch the source of the Arveiron were once powdery snow upon the slopes of the Col du Géant. Could our vision penetrate into the body of the glacier we should find that the change from white to blue essentially consists in the gradual expulsion of the air which was originally entangled in the meshes of the fallen snow. . . . The snow which falls upon high mountain-eminentes has often a temperature far below the freezing point of water. Such snow is dry, and if it always continued so, the formation of a glacier from it would be impossible. The first action of the summer's sun is to raise the temperature of the superficial snow to  $32^{\circ}$ , and afterwards melt it. The water thus formed percolates through the colder mass underneath, and this I take to be the first active agency in expelling the air entangled in the snow. But as the liquid trickles over the surface of the granules colder than itself it is partially deposited in a solid form on these surfaces, thus augmenting the size of the granules and cementing them together. When the mass thus formed is examined, the air within it is found as round bubbles. . . . The frost of the succeeding winter may, I think, or may not, according to circumstances, penetrate through the layer, and solidify the water which it still retains in its interstices. . . .

"The ice of the *névé* at  $32^{\circ}$  may be squeezed or crushed with extreme facility; and if the force be applied slowly and with caution, the yielding of the mass may be made to resemble the yielding of a plastic body. In the depths of the *névé*, when each portion of the ice is surrounded by a resistant mass, rude crushing is of course out of the

question. The layers underneath yield with extreme slowness to the pressure of the mass above them; they are squeezed but not rudely fractured. . . . Thus, then, the lower portions of the *névé* are removed by pressure more and more from the condition of snow, the air bubbles which give to *névé* ice its whiteness are more and more expelled, and this process continued throughout the entire glacier finally brings the ice to that state of magnificent transparency which we find at the termination of the glacier Rosenlaui and elsewhere."\*

From data obtained by recent investigations concerning this evolution of snow into ice, M. Forel recognizes three distinct regions in a glacier, defining as many distinct stages of development:

"1. *Névé* (*enfance du glacier*). Excess of snow, the heat of summer not sufficient to melt the (entire) snow (fall) of the year. All the water produced is absorbed and assimilated by the profound icy layers: the temperature deep down (in the mass) much below  $0^{\circ}\text{C}$ . *Ligne de séparation*. The heat of summer sufficient to melt all the snow of winter. But there is no excess of heat to attack the ice.

"2. *Glacier adolescent*. The heat of summer melts all the snow of winter and attacks by ablation a portion of the ice. All the infiltrated water is absorbed and assimilated by the ice: the temperature deep down in the mass much below  $0^{\circ}\text{C}$ . even at the end of summer. . . . The region of growth, the region of youth, in which the glacier is developed. *Ligne de séparation*. All the infiltrated water is absorbed by the increase of the granule of the glacier. Commencement of the glacial torrent at the end of sum-

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\* "Glaciers of the Alps," pp. 249, 250, 251, 252.

mer. At the end of summer the temperature beneath the surface reaches  $0^{\circ}\text{C}$ .

"3. *Glacier sénile*. The heat of summer is in excess; the infiltrated water exceeds the quantity necessary for the reheating of the ice, which remains at  $0^{\circ}\text{C}$ ., and the excess of water flows off into the glacial torrent. The temperature of the ice remains at  $0^{\circ}\text{C}$ . during summer. . . . The region of decrease, region of old age, when the glacier falls into decay."\* The first line of separation is apparent upon the surface—the second is not.

As the physiological forces at play in animal organisms can best be studied in their embryos, where they are least complicated, so the physical forces at work in a glacier can best be investigated in the embryonic névé, before the *glacier d'écoulement* has seen the light of day. Now no one, so far as I am aware, has ever witnessed the birth of a glacier, but from the data furnished by those questioned in their old age, one can arrive at some sort of idea as to what must take place.

In the first place before the glacier, or even the parent névé, has appeared upon the scene, the climatic conditions of the region in which it is to have its birth must undergo a radical change. If previously dry, it must have its supernatant atmosphere laden with moisture. If moist before, it must at any rate have its mean annual temperature lowered to such a point that the moisture will be so largely precipitated as snow that the snow which falls will exceed that which is wasted. The once sunny skies are now frequently overcast with dense leaden clouds, the once genial air has taken on through a greater portion of the year an arctic temperature, while the oc-

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\* "Le grain du glacier." Archiv. des Sc., tome 7 (1882) pp. 366-7.

casional downpour of a tropical shower has given place to long-continued and heavy falls of snow.

Gradually the rains and mists of summer, and the water from the melting snow, percolate through the dry mass. Gradually the now saturated beds become compacted in their lower parts by the pressure of those above, and consolidated by the frosts of winter. A part of the surface is licked up by the rays of the sun and the heated air, while from exposed rock surfaces huge shreds of snow are discharged as avalanches. But all this avails nothing in the face of the enormous falls of snow.

"Supposing," says Tyndall, "two feet of snow a year to remain upon the Col, this would raise it to a height far surpassing that of Mont Blanc in five thousand years. Such accumulation must take place if the snow remain upon the Col. But the accumulation does not take place, hence the snow does not remain on the Col. The question then is, whither does it go?"\* Let us see. The accumulation evidently must go on until the cohesion of the mass is overcome by the enormous pressure brought to bear upon it. At this point and not before, the glacier first makes its appearance. When once started on its way down the mountain side, the glacier would descend below the snow-line to a point where its downward motion is just counterbalanced by the melting of the ice. Should the mean annual temperature of the region be raised or its humidity lowered, from some conjunction of physical or cosmical causes, the glacier will shrink in dimensions and the terminus will retreat up the mountain side. This retrogression has taken place during past

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\* "The Forms of Water," p. 49.



ages on an enormous scale, as old marginal moraines and stranded erratics clearly attest.

Having now traced out the life-history of a glacier, if I may borrow this term from Biology, let us revert to the main point at issue—the investigation of the causes potent in the creation and maintenance of its motion. As the superficial portions of the *névé* are comparatively light and dry, it must be from the more profound layers that the icy tongue is thrust forth. The distinct strata, prolonged from the *névé* into the glacier, that can be traced in horizontal bands along the icy walls of some crevasses, furnish an absolute proof of this assumption. Whatever may be the case later in its development, it cannot be the weight of the glacier itself which drags it down, as none yet exists. We can account for its first appearance only by supposing that it is *squeezed out* from underneath the *névé* by the weight of snow and ice above it.

When the glacier has attained its full size it seems natural, and I think that all the phenomena of its motion indicate, that the same forces that gave it birth must play a prominent part in its maintenance. We can, I think, see how the snow accumulating on the surface, and gradually compacting and settling down, must force out from its profounder depths fresh material to make good the terminal waste, and thus keep in motion the icy stream. This translation of downward pressure into a lateral thrust against the upper reaches of the glacier, causes the *névé* to act like a vast wedge. There is a limit to the glacier's power to resist its downward progress; there would be almost none to the increase of pressure coming from an indefinite accumulation of snow upon the *névé*. The

force then which *absolutely compels* the glacier to move, *nolens volens*, whether upon a steep or a gentle grade, whether rigid from the intense cold of winter, or mobile from the heat of summer, is the incessantly acting and enormous pressure exerted by the snows accumulating upon the *névé*. If last winter's snow-fall has not produced the necessary excess of pressure, next winter's will give another turn to the screw. In this vast ice-mill the power can be indefinitely accumulated—the resistance, so far from increasing, grows less.

Pressure, as Prof. James Thompson has proved, tends to liquefy ice by lowering the freezing point of water. Pressure then must also produce a partial liquefaction of the granular *névé*, tending to weaken the cohesion of its particles and facilitate its motion. Thus gravitation at work in the *névé* is concerned in the motion of the glacier, directly by forcing it down the slope, and indirectly by increasing the mobility of its particles.

Let us make a rough calculation what the total of this pressure must amount to in pounds. "It has been estimated," says Prof. Maury, "that the average annual snow-fall of the Alps amounts to sixty feet, which is equivalent to six feet of water."\* Now a cubic foot of distilled water, at standard temperature and pressure, weighs a little over 74 pounds. So every year each square foot of the surface of an Alpine *névé* is put under a *fresh* pressure of above 444 pounds: Or take a glacier with a *névé* surface of a quarter of a square mile, and the *accession* in pressure *each year*, from the snow-fall alone, would amount to the enormous sum of over 1,547,251 tons. Let us go a little further: take 400 feet

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\* "Physical Geography," p. 94.

as the average depth of the névé, and it would doubtless fall below the average of many; then, as névé ice is "more than three times"\* as dense as snow, the pressure exerted by the névé, upon its lower layers, and in consequence upon the upper reaches of the glacier, must be about 8,800 pounds, or over 4 tons to the square foot. Cut this estimate down one half, to allow for possible over estimation of the density and depth of the névé, and we still have left a pressure of 2 tons to the square foot exerted against the upper cross section of the glacier. With such figures before us, I think it need no longer excite wonder that the névé, under the ceaselessly acting force of gravitation, can mould its own material, and become the principal factor in the glacier's motion.

Heat, the other great engine at work, plays its part, by causing the saturation of the snow with the water that comes from the melting surface, and further must assist gravitation in weakening the cohesion of the névé. Both of these forces are at work in the glacier in a modified form to *facilitate* its downward motion.

Before proceeding, however, let us first get a clear idea of the structure of glacier ice, and of the size, form and mode of aggregation of its component granules. "The glacier is therefore a mass of solid water of the special structure which mineralogists describe under the name of crystalline; it is an agglomeration of crystalline granules locked one within the other, as are the granules of crystalline marble or of a lump of sugar. . . . The crystalline granule increases in size from the top to the bottom of the glacier's course: at the limit of the névé, the granule is larger than a small hazel nut; in the

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\* "Physical Geography," p. 95.

middle portion of a large glacier, it is the size of a walnut; at the terminal portion that of a hen's egg. At the lower extremity of the Aletsch glaciers, the lower Aar and the Rhone, I have measured granules up to 7 and 8 centimeters in their major diameter."\* . . . These granules (*cristaux*) have not a regular form: they are irregular polyhedrals, locked (*enchâssés*) one within another: the irregular curved faces of two neighboring granules are perfectly opposed to one another. So closely are these faces pressed the one against the other, that each granule retains the others in place and is itself retained by them, so that if "one succeed in disengaging one of the granules from a block of the glacier, then all the others disengage themselves more or less easily and the entire mass falls into separate pieces."†

So far we have treated of established facts. But when we would arrive at an accurate knowledge of the crystalline structure of the granules, we find that nothing as yet has been definitely determined. Brewster was one of the first to make use of polarized light in the study of glacial ice. Then Tyndall, in his celebrated experiment, by condensing rays of heat in the interior of a block of ice, disclosed its beautiful six-sided crystalline structure; for in the disk-like areas of fusion appeared the star-shaped "ice-flowers," as he called them. In 1861, Sonklar came to the conclusion from his observations that in a given granule the axes of crystallization were parallel, and hence that each granule must be a single crystal, but that between two neighboring crystals there was no uniformity of direction of the planes of crystallization. Bertin, on the contrary, in 1866 came

\* "Physical Geography," p. 95. † "Le grain du glacier." Arch. des Sci. tome 7.

to the conclusion that there is a certain determinate arrangement of the axes of crystallization, and that the ice of the glacier in its crystalline structure is little by little brought to resemble lake ice. Ch. Grad and A. Dupré advanced the same views in 1869. J. Müller in 1872, and F. Klocke in 1881, differed from Bertin, and held that the planes of crystallization in glacier ice lay confusedly in all directions, which view Forel espoused in 1882. Later in the same year Hagenbach-Bischoff published his views, in which he steers a middle course. On the one hand he differs from Klocke in that he believes that there is "a certain predominant orientation which is in the direction of pressure :"\* on the other he would have Bertin, Grad and Dupré "replace the term *parallelisme de tous les axes* by the more restrictive expression *direction prédominante*."†

Whatever may be true in regard to the planes of crystallization, it is certain that "the ice of the granule of the glacier is remarkably dense (*compacte*),"‡ while that which cements adjacent ones together must be loose in texture, principally from the bubbles of air located there. This is the reason why a blow of the hammer will cause "the ice" to crumble to pieces—break *between* the granules instead of *across* them. Now it is clear that whatever will bring about mobility among the granules will facilitate the motion of the glacier. And it is equally clear that the weakening of their cohesion, the great essential of mobility in all bodies, must come through a partial melting, which would of necessity

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\* "Le grain du glacier," Archiv. des Sci., tome 8, p. 359.

† Ibid., p. 360.

‡ Ibid., tome 7, p. 332.

originate in the interstitial ice and remain there as long as it was partial. This melting of the interstitial ice, besides weakening the cohesion of the granules, must, by the very act, form about each a water-film which would of necessity facilitate the sliding of one past the other.

Now gravitation, as we have already seen, produces this partial melting by lowering the freezing point of water under pressure. Pressure in the glacier must originate in four ways: that which comes from the downward thrust of the ice masses higher up; that which comes from the elevation of the glacier's head above the level of its lower reaches; that which comes from its own superincumbent weight; and finally, that which comes from the irregularities and friction of its bed.

Heat, by causing the ice of the glacier to thaw and soften, also tends to produce mobility among its constituent particles by weakening their cohesion by a partial interstitial melting within the body of the glacier and by lubricating them with the water which has pervaded the mass from the melting surface above.

Having now given in detail the different ways in which heat and gravitation must act to produce motion in glaciers, let us see how this explanation of their combined action will harmonize with known glacial phenomena. As has been stated above the irregularities and friction of its bed must tend to produce pressure in a glacier and tension at right angles to this pressure, of which its veined structure and crevasses are an index. Thus a change of inclination of the bed of the channel, the widening or narrowing of its sides and the friction of both, produce respectively transverse, longitudinal and marginal crevasses and veins. Ice of the peculiar granu

lar structure to be found in glaciers, when under slowly applied but enormous pressure, aided by the heat of sun and air, will, like viscous bodies, move differentially, but on the slightest transition from the previously existing conditions of its channel, will, unlike these, experience fracture or compression as the case may be. The ice will pursue preëxisting lines of motion, first as far beyond the point where the change takes place as the cohesion of the mass will resist tension, or pressure, and then sooner than yield will break or become compressed. In other words granular ice, owing to the physical conditions under which it exists in the glacier, experiences an almost perfect mobility of its constituent particles, *within very narrow limits; but exceed these by a hair's-breadth*, and it will lose its continuity or change its aggregate form sooner than yield to the stress put upon it. Tar and other viscous bodies, under like conditions, would experience a mobility of particles within very wide limits; for in tar it is the ultimate molecules concerned in the motion—not the discrete granular particles as in ice. The former is a true viscous body, the latter has been fitly called a *viscoid* body.

In accounting for the erosion wrought by a glacier, it is only necessary to compare it with that of running water, remembering the difference between the free flow of water and the limited mobility and unyielding nature of glacier-ice. As the particles constituting the mass of the ice are mobile only within very narrow limits, we should expect it when in motion to wear down the inequalities of its rocky bed, whether hard or soft, to one common level. On the other hand, the molecules of water, having an almost perfect freedom of motion in

seeking lines of least resistance, would spend most of their erosive energy upon the softer rocks, leaving the harder ones in bold relief. In like manner we should expect ice, when effecting erosion by means of rocks and earth held in suspension, to act, as Agassiz has expressed it, "like a vast file set in paste," creating ruts and scratches in the surface of its bed, parallel to the line of its swiftest motion, since the graving tools can of necessity experience no greater freedom of movement either upward or sidewise than the ice that holds them as in the grip of a vise. On the contrary, the foreign matter held in the slight and uncertain grasp of running water, curvetting hither and thither with every freak of its water-carrier, erodes irregularly and erratically. Finally ice, from the strong cohesion of its mass, would be expected to pass over the small inequalities of its bed, like a moving bridge, only affecting those of larger area. Water would adapt itself to every irregularity of its bed, even the smallest. And so in every particular we find it in nature, as the polished billowy surfaces, parallel scorings and *roches moutonnées* of old glacial regions and the irregularly carved rocks of old river beds, will respectively attest.

That a glacier must move more slowly in winter than in summer becomes evident at once when we consider the part heat plays in its movement. Moreover, it is evident that the motion in summer must be exactly as much greater than that in winter, as the heat from all sources during the summer months exceeds that of the winter months, less the increase of motion that must of necessity result from the increased pressure of the winter's snow-fall.



That the friction of its bed should produce in viscid ice the same differential motion it does in viscous tar is clear from the above reasoning. We should naturally expect that the granules near the centre and surface of the glacier, free from the friction and contact of another surface, would gradually gain on those retarded by the sides and bottom of the bed. It is also natural that the velocity of the glacier should increase with the slope, as increased slope means increased pressure and decreased resistance to its downward progress.

That it should increase with the depth is also evident, since that means increased pressure from the additional weight of the superincumbent masses.

That glaciers should conform to the larger and more gentle irregularities of the bed, and not to the smallest and sharpest, is clear from the above enunciation of the properties of granular ice. The cohesion of the usually rigid ice, under the stress of pressure and heat, is weakened far enough to allow it *gradually* to adapt itself to the *larger* inequalities of its bed, but under *no circumstances* will it obtain mobility of particles sufficient to allow it, like fluid bodies, to *suddenly* accommodate itself to *smaller* inequalities.

All the conditions discussed above become, of course, magnified in polar glaciers, as here we have huge sheets of ice that, as a general rule, disregarding the natural conformations of the ground, sweep over hill and dale alike, and finally push out into the sea, to give birth there to bergs and floes. These images of still vaster ice formations, in the past ages of our globe, must exist under an enormous pressure both from *névé* and glacier; for the snow-falls on these lands of the midnight sun are

very heavy and of frequent occurrence through the greater part of the year, and, in consequence, the resulting glaciers are of gigantic proportions. Some attain a thickness of several thousand feet, and, as in the case of the Humboldt glacier, a frontage of forty-five miles, while the Antarctic ice-cap constitutes the vast grave-stone of a continent forever dead to man. This enormous increase of pressure, as has already been stated, insures a higher rate of motion as compared with Alpine glaciers, amounting to as much as sixty feet per day.

In conclusion, I would sum up by saying that it seems to me the action of gravitation, especially that at play in the *névé*, must be the most important factor concerned in glacier motion, while the action of heat, though essential for the evolution of snow into ice, must ever be regarded as subsidiary to the former. Gravitation acts uniformly all the time and under all conditions—heat can have but little influence in the dead of winter or in high latitudes; yet it is just in these regions that glaciers experience the highest rate of motion.

*Occidental College, Los Angeles, Cal.*

PROBLEM OF  
INTER-OCEANIC COMMUNICATION  
BY WAY  
OF THE AMERICAN ISTHMUS.

PROPOSED UNIQUE SOLUTION,  
1866—1888.

BY  
A. ANTHONY DE GOGORZA.

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SYNOPSIS OF MR. ANTHONY DE GOGORZA'S PAMPHLET OFFERED TO  
THE A. G. S., BUT NOT READY FOR PUBLICATION.

The object of this memorandum is :

1st. To vindicate in all its bearings the exactness and fairness of my survey—and to record where Nature itself has *located the "strait"* and marked the place for an inter-oceanic canal.

2d. To explain how my proposed route was reconnoitred—and next officially disregarded.

3rd. To expose the means resorted to, in 1876 and 1880, for attributing to me another and utterly impracticable route, and thereby misleading the learned societies and the public.

4th. And as a sequel thereto, the erroneous information deliberately laid in 1883 before the Senate, in answer to an official query.

In part I.—"*Magna est veritas et prævalebit*"—I attribute the failure of modern explorers : 1st., to their

having always looked for the narrowest crossing ; just as if a leader should choose the narrowest and deepest bed of a river for his troops to ford. 2d., to their having all neglected to consult in the archives of Spain the maps and reports of those who had conquered and held the country for more than three centuries.

I insist upon the fact, that I considered it my first duty to make a thorough search, and that I copied numerous charts and reports, the list of which I give, and from which I unearthed the "*secret of the strait*"—and was enabled to plan and conduct my survey with every requisite element to make it a success. .

That next, in January, 1866, I entrusted the technical work to Mr. Louis Lacharme, whose fitness I had tested for many years in the wilds of South America and California ; who spoke the language of the country, knew how to make friends of the Indians, was broken to the climate and to the hardships of the forest, and was in every way, like his few picked companions, up to the task before him.

They were provided with a full set of suitable tools, from Bunten's mercury barometers, Charles's gradienter, Throgmorton's surveyor's compass, large aneroid barometer, etc., down to sounding-lines, abundant new gold coin, and presents for the Indian Chiefs, such as never reach the hands of traders.

The survey was carried over up the *Tuyra* and *Paya* rivers to the divide, 190 feet above sea level, and down the *Cacarica* river toward the Atrato ; bearings and distances being mapped every 10 minutes, and the altitudes at each stop 1, 2 or 3 times a day.

The results were set down in a short practical report,

accompanied with a detailed map and *original field book*, and a duly acknowledged statement under oath.

I proceeded *first* to Washington, where I submitted the aforesaid papers to a group of influential members of Congress,\* who, on the report of their Engineer (Mr. Edwin Johnson of Middletown, Conn.), that the "tracing for the purpose of a canal was *superior to any hitherto presented*"; and on the advice of the chief officers of the coast survey, resolved to meet the expenses of a resurvey: and therefore obtained from the *Navy Department* the help of U. S. vessels, &c., &c. But when we were already in Panama, and the gunboat *Saco* (Commander Wilson) had gone to bring my former surveyor to join the party, the Congressmen's agent, under the Panama R. R. Co's. influence, left suddenly for New York, and thus and then wrecked the operation.

I then went to Europe, published my report and map, and submitted them to the critical remarks of the most competent men I could find—receiving in every country the same hearty approval that I had, at the start, met with in Washington.

I was even able to incorporate in Paris an "*international company*," with shares of *five thousand dollars each*, to which many an American of rank and wealth subscribed. A preparatory meeting was presided over December 20, 1869, by Gen. N. P. Banks; but the proceedings were brought to a close by the announcement of the U. S. actual official survey January 10th, 1870.

President Grant himself showed his deep interest in

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\* Sen. Sprague, Gen. Benj. Butler, Oakes Ames, Capt. Patterson for Fred. Billings, J. A. Raynor, E. Hoyt, C. K. Garrison, W. E. Dodge, J. H. Griswold, M. Ketchum.

the matter, by requesting Gen. N. P. Banks to hand him my maps and documents for the use of the U.S. expedition.

At Bogotá, in a lecture before the President of the Republic, the Archbishop, the Foreign Envoys and many other prominent persons, I affirmed the existence of a former free communication between the oceans through the valley of the Tuyra; and my conclusion, that in this direction lay the "*to be or not to be*" of a canal, was unanimously accepted.

Again, the distinguished U.S. Envoy at Paris, the late Hon. Elijah Washburn, who knew that I was an American born citizen,\* kindly backed with his commendation a letter of mine to President Gen. Grant, praying for his protection to a *private American concern* to hold the most liberal right of way for a canal across the Darien Isthmus, that I had just obtained from the Colombian Government.

By far the most significant and flattering approval was, however, that of the International Geographical Congress held in Antwerp, in which many of the more eminent geographers, professors and scientists of *all nations* took part, either in person or by letter.

Of the Americans personally present it suffices to name the Emperor of Brazil and Mr. Francis A. Stout, the latter representing the American Geographical Society; and the names of Prof. Agassiz and Com. Maury were also on the list.

After discussion of the question: "*Which is the more favorable place for the opening of the Inter-oceanic*"

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\*My father came to America in 1793, took out his letters of citizenship, Aug. 2, 1796, and married in New York. I myself, as one of the early successful miners in California, and an American, was appointed to represent the State at the Paris Exhibition.

*Canal across the American Isthmus?*" the British Adml. Ommaney, as President of the section of cosmography, navigation and commerce, brought the verdict in favor of Mr. Anthony de Gogorza's *project across the Darien*; upon which the following resolution was *unanimously* adopted: "*The congress recommends the work of the above-named savant to the consideration of the great maritime powers, and of all the learned societies*" (p. 362, 1st vol. of proceedings; and my map of survey, p. 323).

I have no pretensions to the title of "*savant*." But I have pledged my good name to the sincerity of my survey, and under no circumstances can I permit any one, and least of all an officer of my own country on duty, to put it in jeopardy without an energetic protest and rectification.

Further, in Harper's New Monthly Magazine for Nov., 1873, under the title of the "*Secret of the Strait*," a writer whom I do not know copies the summing up of my report, and is led to the positive conclusion (p. 812) that "both oceans mingled their waters as late as the pliocene period."

Finally, Dr. Maak, geologist of the United States Expedition, fully confirms (*p. 167 of the official report*) my theory "of a complete separation of *two distinct cordilleras, between which*, up to the later tertiary period, both oceans freely mingled their waters."

I add that a few thousand dollars and 4 or 5 days of easy work would cover a resurvey from the confluence of the Paya and the Tuyra, and across to the upper landing on the Cacarica, to prove that I have *pointed out the only right place*: and the revival of my grant would be a pure matter of form, since I never made it over

and it has never been withdrawn, either legally or administratively—neither so notified to me.

I now copy from a leading Journal: "The *Darien Canal can be cut* and must be cut! It is wanted by the American people as the unconstructed link of our coastwise transit, and the needed complement of our great ocean domestic trade; and is therefore a peculiarly American enterprise."

If this be true—I conclude—what more? With intervening lagunes 30 feet deep, and the confluence of the Cacarica and the Atrato 12 feet above the Atlantic, just about the mean *overrise* of the Pacific's tide! and the most magnificent harbors at both termini—what more is needed to mark and *record* forever the *place* where to reopen the old channel, and to solve the *great problem*, by making the *American Strait* the natural separation of the two Americas?

Part II.—"*Scripta manent*"—refers to Com. Selfridge's reconnoissance of my route, published in New York, with map drawn for the occasion by Com. Lull; and to the all-important fact of a messenger sent over from Paya January 13th, 1871, by Com. Selfridge with dispatches for the Secretary of the Navy, and letters to the United States Consul at Panama, "announcing *his discovery* of a route for the Canal, with ground favorable on both sides of the divide"—which great news was then published all over the world.\*

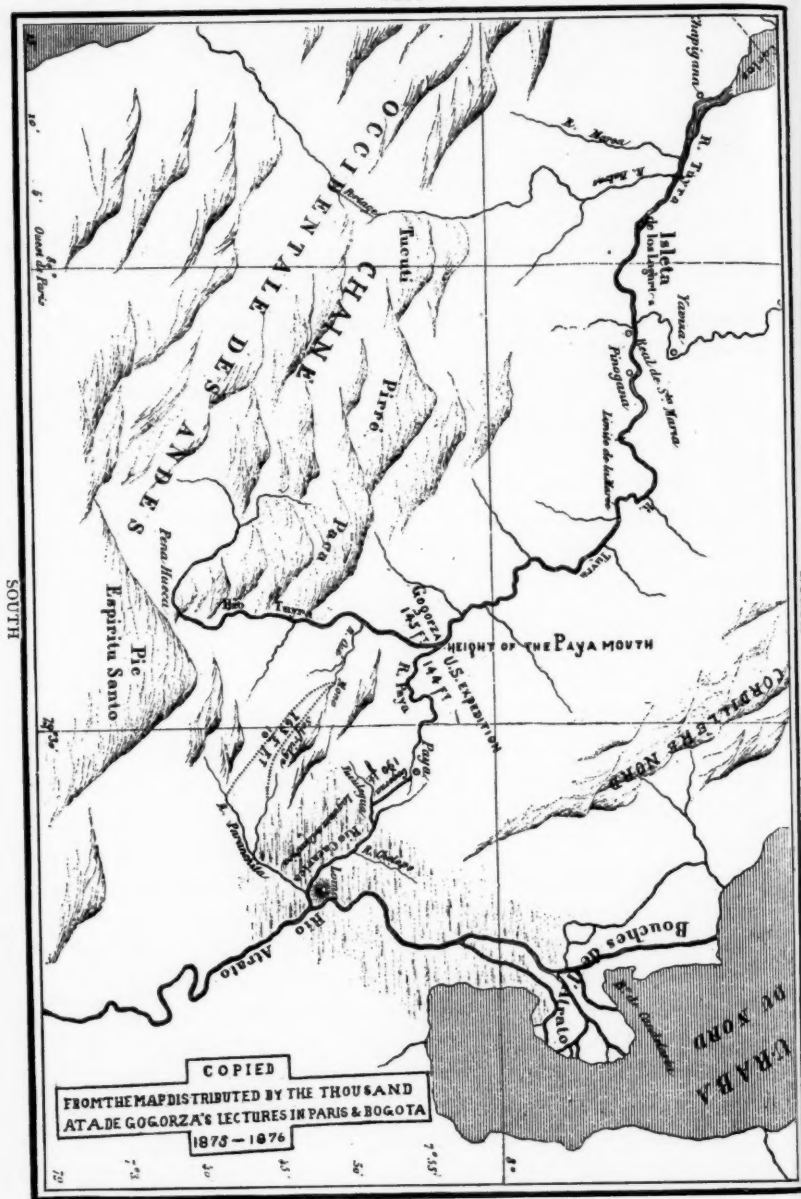
On January 18th, the commander returned on board the *Guard*; but before embarking on February 7th,

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\**N. Y. Herald*, March 1st, 1871, from its *local* correspondent—published *February 10th in Bogota*—and in San Francisco, Cal., Philadelphia, Havre, Paris, London, etc., etc.—all over the world, in fact.



EAST



in the *Nipsic*, which, by the above cited letter, he had requested the United States Consul at Panama to order *at once* to the mouth of the Atrato—he sent Master Couden to run a line of levels along the Paranchita towards the Cué (that this might be made to appear, *when needed*, as Gogorza's route), and instructed Master Sullivan to make a regular survey of the Paya route, which he had himself reconnoitred.

Next, I criticize the *official report* given to the public *only four years later*; a report which, in flat contradiction of the precedent information, states on the same date and from the same place of Paya, January 13th, that "the ground being very broken, Com. Selfridge abandons *this* route to run up the Cué river," and on the 18th, from on board his vessel, confirms his resolution of "adopting the Paranchita as the line of future operations *instead of the Cacarica*;" thus and then plainly *disregarding* my route by Paya with its 190 feet divide, *for his own plan*, to meet Mr. Couden on the Cué at an altitude of 763½ feet.

As to the survey Master Sullivan was ordered to make of the already trodden path to Paya, it appears *officially* to be a hide-and-seek arrangement between both masters; ending with the amazing statement of their "*having been unable to reach the place*—undoubtedly the lowest in the cordillera, that Com. Selfridge crossed in his way to Paya;" and the document closes with the assertion "that there remains no doubt of the inadaptability of the Darien for a Canal—except by the Napipi route (which is no part of Darien)!"

I conclude, for my part, that in spite of the inconsistency of this report, and the avowal that my route had not

been surveyed, I must do the Commander the justice to remark that he abstained at least from maliciously charging upon me the choice of the Paranchita and Cué route.

In Part III.—“*Is fecit cui prodest*”—I deal plainly with R. Adml. Ammen's communication of 1876 to the American Geographical Society, printed in 1880, in Philadelphia, in a pamphlet under the title of the *Inter-oceanic canal question*, but of which I could not obtain a copy until the present year.

I show the R. Adml.'s hastiness of language in branding as *adventurers* many honorable members of the Second International Geographical Congress, of 1875, held in Paris, who felt that Com. Selfridge's Darien survey amounted to *but little*; and the way in which he contradicts himself, when, after emphatically praising the work of the officers that he had appointed,—he denounces, in so many words, that very same “Com. Selfridge's reports on the Napipi route as of pure invention, without himself or any of his party having ever been on the ground.”\*

Next, I express myself indignant when the R. Adml. attributes to me the route by the Cué—a river not even mentioned in my memorandum nor in my maps of 1868 and 1870—and when he says, in words nothing less than offensive, that “the line run in examination of this supposed route established the fact that Lacharme and Gogorza were pretenders,” etc., etc.

How could a line planned by Selfridge, and surveyed by Couden, make a pretender of Gogorza? If called upon to explain such allegations, the R. Adml. could not

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\* Pages 55, 71 and 76.

bring forward a single honest argument in their support. Meanwhile, the credit given to his official position did hurt a legitimate undertaking; so that impartial minds may well inquire, "*What can have been his motive?*" and weigh *his responsibility* in the premises.

Again, in a virulent article inserted in the N. A. Review for February, 1880—R. Adml. Ammen says that "in April, 1866, a Mr. Gogorza sought his acquaintance."

To this I answer by the copy of a letter from a Capt. Daniel Ammen, dated Navy Yard, Washington, November 13th, 1865, seeking information which I willingly gave by return mail from Panama, December 12th, 1865.

He says further that on presentation of my pamphlet in the fall of 1876 *by the Secretary of State*, he pointed out by the height "given to the mouth of the river Paya, *that what was asserted as a fact was a mere fallacy.*"

Well, the height given by me to the mouth of the Paya, in 1866, was 145 feet (as acknowledged by Com. Selfridge, p. 35 of his official report)—and the United States Engineers gave 144 feet in 1871—one foot difference on a run of six days and above 60 miles!

To the other improper and rather personal remarks, I have to say that the fallacy lies not with me, but with the Rear Admiral, who is decidedly adrift in regard to the subjects of which he means to write.

Part IV. "*Seek and ye shall find,*" May 2d, 1883. In compliance with the Senate's resolution, the Secretary of the Navy communicates the *information collected by the Bureau of Navigation* (of which R. Adml. Ammen was then Superintendent) about the problem of inter-oceanic communication by way of the American Isthmus.

This information fills an extensive book containing 249 quarto pages and numerous maps.

It begins with the discovery of America and touches many subjects, though it omits some interesting facts pointing to the strait, and distorts some others; it criticises M. de Humboldt and sings the praises of Rear Admiral Ammen; invents an upheaval theory; has some botanical description which is erroneous; and indulges also in Darwinism.

But the compiler, who is quite profuse in his references to Tehuantepec, Nicaragua, Chiriqui, Panama, etc., says, p. 70, that "*a brief reference only will be made to the project of Gogorza.*" He then describes *exactly* the line followed by my surveyor "up the Tuyra and Paya rivers, across the divide 190 feet—and down the Cacarica towards the Atrato."

The sixteen following pages and maps are devoted to a description of lines drawn from 1520 down to our days: and when my line is fairly rubbed out of the reader's mind, the compiler describes likewise exactly the "*line planned by Com. Selfridge, from the Atlantic up the Atrato and Paranchita, and from the Pacific up the Tuyra and the Cué; the parties meeting at a point of the divide above 800 feet high. The object of the survey was to prove the utter impracticability of the route.*" And then he concludes: "*The result of this survey settled the project of Gogorza.*"

Is it necessary to point out once more, how disingenuous it is to describe as mine an utterly impracticable route confessedly planned by the Rear-Admiral's chief officer? Or need it be shown how disrespectful and how inconsistent it is to affirm *in an official report* to

the U. S. Senate, that a line *via* the Paranchita and the Cué settles my project for a line *via* the Cacarica and the Paya?

Without further comment, I contend that the *U. S. Inter-oceanic Commission*, of which the Rear-Admiral was a member, was misled, as the U. S. Senate also was misled in this matter; and that the decision arrived at by the Commission is therefore *disqualified and null*. Further, if Master Sullivan could not find the much-beaten track to Paya to which he had been ordered, how did the report from there, March 19th, reach London "of an elevation of divide not over 150 feet, and hopes to find a lower point in the dividing ridge"?

It is my hope that a man will be found in the United States Senate who, for the honor of the country, will call for an inquiry, by which many other strange things, indeed, may be revealed.

*"Seek and ye shall find."*

ANTHONY DE GOGORZA.

## GEOGRAPHICAL NOTES.

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THE PRONUNCIATION AND ORTHOGRAPHY OF GEOGRAPHICAL NAMES.—It is to be hoped that the International Geographical Congress of 1889 will do something for the proposition, at least, of a working system for writing the names of tribes and peoples and places in those parts of the world that are not European by language. Schemes there are in abundance, and any one of them, if it were generally adopted, would do away with a vast amount of confusion; but the difficulty is to get a concert of action among geographers. This the Congress alone has the power to secure, and the coming occasion ought not to be lost.

No one of the obstacles that stand in the way of the adoption of a prime meridian, or the introduction of the decimal system of weights and measures, has to be encountered in this reform. National pride, mental habits, old associations and darling vanities are left untouched, for the outlandish names, strange under any form, have taken root neither in English nor in German, nor in French nor in Italian.

Prof. Alfred Kirchhoff treats this subject of pronunciation in the *Deutsche Rundschau für Geographie und Statistik* for October, with special reference to the practice of German travellers and writers, and the correction of the existing errors in the German transcription of foreign names.

With or without the support of the International Geographical Congress every traveller, of whatever language, can observe the simple recommendation with which Prof. Kirchhoff closes his paper :

"The more we ought to insist upon pronouncing names as nearly as possible in the way they are sounded on the spot, so much the more it becomes the duty of our explorers to give us the precise sound and accentuation of all names. How easy it is to write after Chihuahua (Che wah' wa), and how much it helps !"

ON THE OCCUPATION OF TERRITORY.—The Institute of International Law, which met at Lausanne in September last, made an effort to agree upon the rules and principles to be applied to the occupation of territories, either uninhabited or in the possession of people not yet civilized. Mr. Martitz, of the University of Tübingen, presented a report from the committee appointed in 1885 to consider the subject. The first article of this report declared : "Any and every region, which is not found to be under the sovereignty or protectorate of one of the States which form the community of the Law of Nations, is to be held and considered as a territory without an owner ; and this, whether the said region is inhabited, or not."

If this principle is admitted, says the Madrid *Revista de Geografia Comercial*, it follows that all the savage or barbarous tribes of Africa are to be regarded as destitute of individual rights, and are, therefore, at the mercy of the first comer. This is neither more nor less than a law of force, invented for the use of civilised nations in order to enable them to wrest from inferior races the country that is rightfully their own. The Institute took the same view, and rejected the article.



M. Engelhardt, of the French diplomatic corps, proposed the adoption of the following resolution :

"The Institute, considering that the greater part of the acquisitions of territory made within these later years in the African Continent have for a basis agreements made directly with the native chiefs, declares itself favorable to this proceeding, and holds that it ought to be the rule for future occupations."

The Institute approved the sentiment of the resolution, but decided not to commit itself to the recognition of the rule.

THE CROSSING OF GREENLAND.—Dr. Nansen, a Norwegian explorer, on the 17th July last, reached Sermilik Fjord, on the E. coast of Greenland,  $65^{\circ} 30' N.$  Lat., intending to cross the country to Christianshaab on the W. coast.

The attempts of Dr. Hayes and Nordenskjöld and Lieut. Peary were all made from the W. side, and Lieut. Peary, the most successful, penetrated only 100 miles, though the Lapps of Nordenskjöld's party reached a point 135 miles from the coast.

A letter from Dr. Nansen to Mr. A. Garuel of Copenhagen, is published in *Nature*, of Nov. 22 :

GODTHAAB, OCTOBER 4.

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As you will know, we left the *Jason*, the Norwegian sealer, on July 17th, and expected to reach the shore the next day. But in this we were sadly disappointed. Screwing ice, maelstroms, impassable ice, where it was alike impossible to row or to drag the two boats, stopped us.

One of the boats was stove in, but we got it repaired again. We drifted seawards at a speed of thirty sea miles in the twenty-four hours. Drifted in the ice for twelve days. Strove hard to get to the shore, were three times on the point of succeeding, but were as often carried out to sea again by a current stronger than our power of rowing. Were once, for a whole day and night, very near perishing

in tremendous breakers of the sea against the ice-rim. After twelve days' drifting about, we managed at last to get ashore near Andretok, north of Cape Farewell, at 61° and some minutes of northern latitude. We rowed again northwards, reaching Uminik, from which point the crossing of the inland ice began on August 15th. We directed our course for Christianshaab on the western coast. Encountered severe snowstorms and had heavy ground. Estimating that it would be too late to reach Christianshaab in time for this autumn's vessel, we altered our course and steered for Godthaab, the ice-fields in that direction having besides been hitherto trodden by no one. After altering course, reached height of 10,000 feet, with temperature of 40° to 50° C. below zero. For several weeks we remained at an altitude of over 9,000 feet. Tremendous storms, loose, new-fallen snow, enormously difficult passage. Towards end of September we reached at last the western side above Godthaab. Had a perilous descent, on ugly and very uneven ice, but got safely down to Ameralik Fjord. Managed to build a kind of boat from floor of tent, bags, bamboo reeds, and willow branches. In that frail craft Sverdrup and I rowed away and arrived here on October 3.

The four men are left at Ameralik, living there on short rations fare, but will be sent for as soon as possible. There you have in short outline our Saga. We are all perfectly well, and everything has been in the best order. I hope that we may catch this steamer, and that instead of this letter you may see our sunburnt faces,

With many greetings, yours ever devotedly

FRITHIOF NANSEN.

This letter, with one from Mr. Sverdrup to his father, was sent from Ivigtut.

Mr. Sverdrup repeats Dr. Nansen's story, with one or two cheerful additions :

"I must hurry up," he says, "as we are going to dine with the parson, and, in fact, we have not had time for anything, as since arriving here we have gone from one social party to another. You may see from that how well we are off. I was the only one of our whole party who got over all the tremendous fatigues without the smallest ailment. I am and have been all the time as fresh and sound as a fish."

HUDSON'S BAY AND HUDSON'S STRAIT AS A NAVIGABLE CHANNEL.—A paper on this subject, read before the Royal Geographical Society in June last by Commodore A. H. Markham, R. N., is published in the Society's *Proceedings* for September.

Commodore Markham gives a brief description of the

Bay (which he calls, oddly enough, the "Mediterranean Sea of North America"), a sketch of its history, and the results of his own experience.

Hudson's Bay lies between  $51^{\circ}$  and  $64^{\circ}$  N. Lat., and  $78^{\circ}$  and  $95^{\circ}$  W. Long. It is about 900 miles long and 600 wide, with an area of about 500,000 square miles. It is remarkably free from rocks and shoals, and the water has an average depth of 70 fathoms. It is added on the authority of Dr. Bell, of the Canadian Geographical Survey, that storms are rare in the Bay, that icebergs are never seen, and that fogs are infrequent and of short duration. The climate of the shores is mild and genial during the summer months, but the winters are very severe.

Hudson's Strait is a deep channel, 500 miles in length, between Labrador and the islands of Arctic America. The average breadth is 100 miles, but the narrowest part of the channel is 45 miles wide. There are no shoals nor rocks, to speak of, and the soundings in the Strait vary from 150 to 300 fathoms.

The historical account and the record of his own experiences are long and interesting, and Commodore Markham ends them with these words: "Since the keel of Hudson's good ship, the *Discovery*, ploughed the waters of the Strait (in 1610), the passage has been made over 500 times, whilst the losses due to the ice might be summed up on the fingers of one hand." He maintains that Hudson's Strait is perfectly navigable and free from ice in August, and later in the season, and that powerful steamers could make the passage without difficulty.

The question is rightly said to be a purely geograph-

ical one, but Commodore Markham has so far forgotten himself as to write, without fear of the obvious retort, that "Monopolists and persons interested in other routes represent the difficulties offered by the ice in Hudson's Strait as fatal to the success of the project," (for a line of steamers to connect with a railroad between Winnipeg and Hudson's Bay).

In the discussion that followed the reading of the paper, Dr. John Rae said that Commodore Markham's experience was limited to a single voyage, and that as for Dr. Bell, there was no one on whom he (Dr. Rae) could place less reliance in questions relating to Hudson's Bay and Hudson's Strait.

What the obstructions are in the navigation of the Strait was shown by the following extracts from the ice records kept at the stations:

"September and October, 1884 (2 stations): ice heavy and close packed in Strait 27 days; ice heavy and a little water in Strait, 23 days; foggy, 5 days; strong gales and snow, 5 days.

"Four months, June, July, August and October, 1885, three stations: ice heavy and close packed, 98 days; ice heavy and a little water seen, 54 days; foggy, 6 days; dense fog, 1 day.

"Two months, June and July, 1886, at three stations: ice heavy and close, 43 days; ice heavy and some water, 42 days; foggy, 5 days; strong gales or hurricanes, 2 days; strong gale and thick snow, 1 day."

These extracts would be more convincing if the figures did not seem to defy the rules of arithmetic; but the phenomena described beautifully illustrate Commodore Markham's notion of the Mediterranean Sea.

CALIFORNIA.—In the *Deutsche Rundschau für Geographie und Statistik*, for November, Mr. Dionys Friedrich Rosenfeld, professor in the Hagi Christu-Lyceum at Constantinople, devotes eight pages to a sketch of California. The strictly geographical part of this sketch is fairly correct; but the statistical portion and the account of the people show that, if light comes out of the East, it does not always return to the place whence it came.

There are, according to Prof. Rosenfeld, 33 counties in California, and the capital of the State is Benicia, on Carquines Strait. The census of 1880 gives the State 53 counties, and the capital is, and has been for thirty-four years, the city of Sacramento.

The land is rightly enough described as a paradise, but it will astonish Californians to learn that the immediate neighborhood of San Francisco is the loveliest region in the State.

Prof. Rosenfeld holds very decided opinions concerning the people, many of whom, it seems, are the scum of Europe. He notes, at the same time, that the Germans are held in higher regard in California than elsewhere in the United States; a distinction which may, or may not, be due to the character of the scum. Besides the Germans, there are Irishmen, Englishmen, Chinese, Indians, a few Persians, and the Americans, "who fancy themselves the lords of the soil." There are Mexicans, also, whom Prof. Rosenfeld calls Spaniards, once wealthy, but now wrapped in their beggarly pride.

San Francisco makes a fine show, but has not a single building worthy of a great city. Everything there is matter of speculation, and the people are

given up to the grossest materialism. "No tower points to heaven in the city filled with all that is of the earth, earthy;" where the boasted American freedom is a privilege of color, and the august spirit of Christianity meets only with contempt.

The picture is gloomy, but Prof. Rosenfeld must try to possess his soul in patience. Possibly, he underestimates the Californians and overestimates himself.

M. CHAFFANJON.—If this enterprising French traveller does not deceive himself, he has done remarkable work.

He has reached, we are told, the sources of the Orinoco, never before visited, has found the mountain home of the Guaharibos, and has thoroughly studied the communication, hitherto very imperfectly known, between the Orinoco and the Casiquiare.

The results of so much labor will, no doubt, be given to the world in the form of a connected narrative; but it must be confessed that the traveller's letters, of which many have been published during the past year, do not convince the reader that he has narrowed the limits of the unknown. It is noticeable that the Spanish geographers, who are at home in South America, make light of his pretensions. The *Revista de Geografia Comercial*, of September 15th, says that M. Chaffanjon's discoveries were made 150 years ago by many persons, among whom are the Jesuit Father Román, Díaz de la Fuente, and Bobadilla; and also in 1756 by the Marquis del Socorro, Iturriaga, and the other commissioners charged with the settlement of the boundary line with Brazil. The Frenchman's haste to bestow a new name

upon the Sierra Parima, a range of mountains known for centuries, is humorously characterised as a kind of Anabaptist heresy.

It will be remembered that Count Stradelli, who has been travelling in the Orinoco country for a long time, met M. Chaffanjon at Ciudad Bolivar in April, 1887, and saw his maps, which did not bear out his claim that he had visited the source of the great river. This, however, he may have done; but the burden of proof is upon him, where so much is said to have been accomplished.

THE SOURCE OF THE MISSISSIPPI.—A telegram, dated Dec. 1, from St. Paul, Minnesota, announces the return to that place of Mr. J. V. Brower, formerly Register of the St. Cloud Land Office, who has been engaged for two months in the examination of the Itasca basin.

He is reported to have measured the inflow and outflow of all the streams, and his researches, it is said, establish the true source of the Mississippi in the centre of section 21 of the Government survey, in a small lake laid down on the maps of Jean N. Nicollet in 1836. It is added that the true source of the river has been in dispute, and that Willard Glazier's claim to have found it in 1881 is now proved to be false.

It is proper to say that Glazier's claim never was recognised for a moment by any one who had taken the pains to look into the matter. Mr. Russell Hinman of Cincinnati, in a letter to *Science*, of Aug. 13, 1886, thoroughly exposed Capt. Glazier and his methods, and Mr. Henry D. Harrower, of New York, did a similar good work in a pamphlet published two months later. Mr. Hinman detected Glazier's appropriation, word for

word and figure for figure, of a table of Meteorological Observations made by Schoolcraft in the year 1820 ; and Mr. Harrower printed this table.

The case was closed long ago ; and the only wonder is that Mr. Brower should have remembered that there had once been such a person as Capt. Willard Glazier.

GAURISANKAR-EVEREST.—The Indian traveller Emil Schlagintweit recounts, in *Petermanns Mittheilungen*, *Band* 34, *XI*, the history of the name by which the highest mountain of the earth is known in England and America. The height of the mountain was ascertained by the Great Trigonometrical Survey of India between November, 1849, and January, 1850. Sir Andrew Waugh, then at the head of the Survey, proposed, first to the Indian Government, and later (in 1856) to the Royal Geographical Society, to give to this mountain the name of his predecessor in office, Sir George Everest. This proposal called out Mr Brian Houghton Hodgson, long the English Resident at Khatmandu, who declared that there were already different native names for the mountain, and that he himself always used one of these, the name Devadhunga.

The matter was discussed at a meeting of the Royal Geographical Society on the 11th of May, 1857. Sir George Everest himself was present and expressed his thanks for the honor done to him by Col. Waugh, regarding it as a recognition of the importance attached to the work of the Survey ; but he thought there were peculiar difficulties in the way of adopting the name *Everest*, which the natives would find it impossible to pronounce. It could not be written, either in Persian or



in Hindi, and would be confounded with *O'Brien*, while the mountaineers might perhaps call it *Ob'ron*, but would surely miss the real word.\*

Hermann Schlagintweit, who was in Nepal in 1857, wrote from Khatmandu on the 7th of March to King Friedrich Wilhelm IV. of Prussia, in these words: "This interesting line begins in the East with the heights about Kanchinjunga, to which succeeds the great *group of the Deodunga, lately named Everest*. \* \* \* I had hoped until now that Mt. Everest bore the honored Old-Indian name of Deodunga; but here the whole mountain-group is called Deodunga."

The first mention of the name Gaurisankar is in Map I of the Atlas to the 1st volume of the "Results of a Scientific Mission in India and High Asia" (by the brothers Schlagintweit), published in 1861; and the authority for it is found on page 193 of the 3d volume of the same work:

† "When in spring of 1857 my visit in Nepal enabled me to direct my telescope, in the presence of Jang Bahadur and several of his well-informed Pandits, to this mountain, which is such a prominent object in most of the views of the Sikkim and Nepal Himalayan crest, they most positively called it Gaurisankar or Chingopamari in Tibetan; and when then asked about the other names they had mentioned to Mr. Hodgson, they repeatedly averred that they had not so clearly understood which was the particular mountain meant in the previous

\* Sir George added: "As another instance of the difficulty which the natives experienced in pronouncing English names, he might, among others, mention that the name of the Hon. Mr. Cavendish was pronounced by them 'Humbel go munde.'" *Proceedings Roy. Geog. Soc., Vol I., p. 351, 1855-57.*

† Quoted in English by Mr. Schlagintweit.

questions, alluding to the difficulty of finding the exact peak asked for without any other definition than the latitude and longitude."

The name does not appear in Hermann Schlagintweit's letter to the King, and the reason for its absence is given on page 142, vol. '6, of the *Results*: \* "The highest mountains seen from Phallut are: 1, Kanchinjunga; 2, A very high isolated peak in Nepal. Campbell wrote me some names in a letter, when I mentioned it. Seems exceedingly high. I can hear no names."

The question was not raised again until 1886, when Col. H. C. B. Tanner and Gen. Walker, Director of the Indian Survey, declared themselves in favor of the name Everest, while Mr. Douglas W. Freshfield urged with the greatest ability the claims of Gaurisankar.

The only names of the peak reported by travellers are:

1. B. H. Hodgson, in the *Bengal Records*, No. 27, *Calcutta*, 1857, gives: *In Nepalese*: Devadhunga, Bhairav Langur, Bhairavthan; *In Tibetan*: Gnalham, Nyanam Thangla.

2. Dr. (now Sir) J. Hooker, in the *Himalayan Journal*: *In Tibetan*, Tsungau.

3. Hermann v. Schlagintweit-Sakūnlūnski; *In Nepalese*: Gaurisankar; *In Tibetan*: Chingopamari.

Mr. Emil Schlagintweit explains at some length the linguistic relations and the meanings of these names, of which Gaurisankar alone is exclusively Sanskrit.

*Gaurī* is the name of Himavat's daughter, the wife of Siva, and is here equivalent to the *kind goddess*; while *Sankara*, the *beneficent*, is an appellation of Siva, and

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\* Quoted in English by Mr. Schlagintweit.

the whole word may be translated as "The mountain of Siva and his wife Gauri."

In English and American books and atlases the mountain, it has been said, is always *Everest*; in German and also in French publications the first place is given to *Gaurisankar*, and *Everest* is added below in smaller type. Mr. Schlagintweit proposes the double form Gaurisankar-Everest, in order to close the discussion and to save all acquired rights; but he may find that the climbing of the Himalayas was an easy task compared with the effort to make an end of controversy.

THE ERUPTION OF BANTAIKAN.—This mountain, which is situated about 100 miles to the N. of Tokio, Japan, suddenly woke from the repose of 1000 years into full activity, on the 15th July, 1888. There had been for two days before slight shocks of earthquake accompanied by rumbling sounds, but the explosion was wholly unexpected.

The mountain is about 6,000 ft. high and on its N.E. flank was a subordinate peak known as Little Bantaisan, which rose above three solfataras.

*Nature*, of September 13, quotes the account given by the correspondent of the London *Times*. According to this, Little Bantaisan was blown into the air almost in the twinkling of an eye, and a few minutes later its *débris* had buried or devastated an area about half the size of London. The correspondent was one of a party that visited the mountain. When they climbed to the ridge behind Little Bantaisan they saw to the right the incurved rear wall, a ragged cliff falling to a depth of 600 feet. Everything in front of this had been blown away

and spread over the country for thirty square miles. A very moderate calculation makes the mass of matter so distributed at least 700,000,000 tons. A vast sheet of ash-colored earth or mud obliterated every foot of the former landscape. The streams were dammed into lakes, and not a sign of life met the eye.

Besides the rain of scalding earth and mud, heated rocks and stones, sand and hot ashes, the eruption was accompanied by awful shocks, and by winds, or whirlwinds of extraordinary vehemence. Many of the rock-masses were of enormous size, and one, which was measured, weighed at least 200 tons.

One of the most appalling features of the eruption was the amazing speed with which the mud-stream flowed. When Little Bantaisan blew up, the people of Nagasaka, a village that remained comparatively uninjured, fled across the fields towards the opposite hills. A minute later came a thick darkness. The light returned in 10 or 15 minutes, but in that time the mud-torrent had travelled the ten miles to the village and buried almost all the fugitives.

Nearly 600 persons are said to have perished, but fuller accounts may add greatly to the number.

SCHWEINFURTH IN EGYPT.—In the *Verhandlungen* of the Berlin *Gesellschaft für Erdkunde*, Band XV., No. 8; Dr. G. Schweinfurth gives the results of his explorations in Egypt during the last fifteen years. The state of his health forced him to seek a southern climate, and he reproaches himself with having neglected Egypt in past years while he devoted so much attention to Central Africa; as if a man, he says, were to give deep study

to the roots of a tree, and forget the trunk and the branches.

The almost universal impression that there is nothing new to be discovered in Egypt is in part inexact and in part wholly erroneous.

The name Egypt is too often restricted in its application to the narrow Nile valley, the Egypt of the classical world. We are largely indebted for our knowledge of this region to the French expedition under Bonaparte. It is when we look at the blank spaces on the maps of the Libyan and the Arabian Desert that we see what a mistake it is to regard our acquaintance with Egyptian geography as complete.

Dr. Schweinfurth begins his report with his journey in 1874 to the great oasis in the Libyan Desert, where his observations supplemented those made at the same time by Rohlfs.

In 1876 the first exploring expedition to the interior of the Arabian Desert was undertaken by Schweinfurth in conjunction with Dr. P. Güssfeldt. Starting from Benisuef on the Nile, they went eastward to Wady Arabah and the Red Sea, then south to the eastern slope of the Galala plateau, and thence westward to the Nile. Twenty-two points were astronomically established, and a number of elevations barometrically determined; and the geological results were important.

A second journey in the Arabian Desert was made the next year by Schweinfurth, who started from El-Tibin, above Cairo, and went to the east through the Wady-Waräg. He explored the Galala table-land, and struck the Nile, on his return, at Keneh. The mineralogical specimens collected on this journey are now in the Museum at Berlin. The maps are still in MS.

Still a third journey in the same direction was made in 1878, the point of departure being near Atfeh, which is forty miles S. of Cairo, and the line of travel E.S.E. along the Wady Naumieh to its origin in the heights of the northern Galala, and thence to the Wady Arabah. The side-valleys of the Wady were visited where they cut into the plateau of the southern Galala.

The maps of this exploration are not yet made public, but they complete, it is said, the cartography of the eastern part of the Desert.

In 1879 a geological excursion was made in the northern part of the Desert between Cairo and Suez. This was repeated and extended the following year, and the summer of 1880 was spent in botanizing in the Lebanon.

In 1881 Schweinfurth was joined by Riebeck in a visit to the northern part of the Desert, and the two scientists, later in the year, made an exploration of the island of Socotra. The next year Schweinfurth made a long journey in Upper Egypt and mapped the western limits of the Nile valley. His map, as yet unpublished, is in the Berlin Bergakademie. In 1883 he made a voyage to the Marmarica (Cyrenaica), and in 1884 devoted himself to an accurate geological examination of the plain of the Pyramids and the western border of the Nile valley; passing afterwards through the Desert to the Fayoum. He was the first traveller to make the tour of the Birket-el-Kerun, since Martin's reconnoissance in 1801. In the north of the Birket-el-Kerun he found a hitherto unknown, well-preserved temple of the XIIIth Dynasty, and his survey showed that the outline of the reservoir on the existing maps was very defective.

The longest journey was made in 1884-85, a distance of 1500 miles through the Arabian Desert.

The route was carefully mapped, according to Schweinfurth's practice, but the map is still withheld.

The great traveller is incredulous with regard to Lake Moeris. He says: "The hypotheses which Mr. Whitehouse has set before the world with so much enthusiasm, as to the site and the circumference of the ancient Lake Moeris, are not confirmed by the observations I have so far made;" and farther on he adds: "Mr. Whitehouse seeks to establish a connection between the ancient Lake Moeris and the depression of the surface in the southern part of the reservoir; but this depression shows no trace of a fresh-water deposit, and it cannot be filled from the Nile."

Mr. Whitehouse has the English engineers on his side, and in such a conflict of authorities there seems to be but one way to settle the question, and that is to fill the basin from the Nile.

Arsinoe was explored in 1886, and a geological excursion was made to the Isthmus of Suez. In 1887, Dr. Schweinfurth made another journey in the Arabian Desert and geological explorations around the Pyramids; and in 1888 he joined Virchow and Schliemann in a visit to the Fayoum. According to the latest advices he is now in Arabia, devoting himself to the study of the coffee-tree.

THE STORAGE OF THE NILE FLOOD.—In an address before the London Chamber of Commerce on the 1st of November, reported in the *Chamber of Commerce Journal*, and illustrated by the map here reproduced,

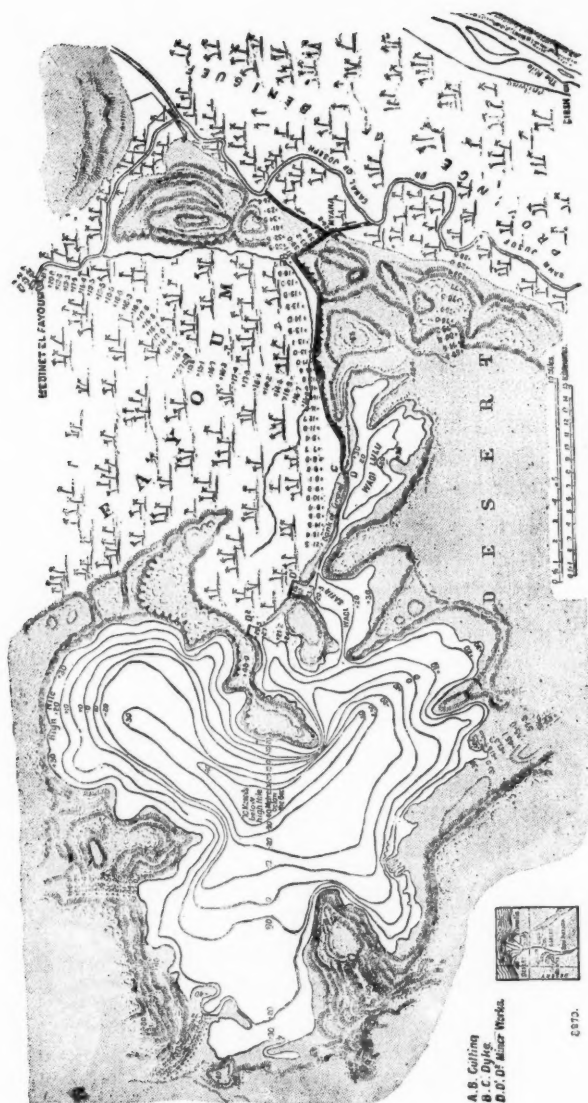
Mr. Cope Whitehouse explained in detail his plan for storing the water of the Nile in the Raian Reservoir, a valley discovered by himself in the desert to the west of the river and about 70 miles south-southwest of Cairo.

The figures given in the address are convincing. At low Nile the supply of water passing the cataracts at Assouan is estimated at 50,000,000 cubic metres a day. The area of land only partially cultivated or wholly neglected in Egypt is more than 3,000,000 acres. To make this fertile, 4,000,000,000 cubic metres of water should be stored for use during the hundred days from February to June. The volume of the High Nile is ten times that of the Low Nile, and even in the worst seasons an enormous excess escapes into the sea. The Raian Reservoir when filled would make a lake larger than the Lake of Geneva, and 250 feet deep, and, allowing for evaporation, would furnish 5,000,000,000 cubic metres. Of the four possible channels between this Basin and the Nile Valley, Mr. Whitehouse has selected, after careful comparison of all the surveys, the one known as the Myana Pass. This is about 12 miles in length, and the cost of construction would be about \$1,000,000.

Adding to the actual outlay for the Reservoir a further sum for drainage and other subsidiary works, the total expenditure in fifteen years might be \$15,000,000. The land tax of Egypt is officially stated at £5,299,965, or about \$26,000,000. The revenue is £9,600,000, or \$48,000,000. The increased tax would amount at present rates to \$10,000,000, and the additional revenue to \$17,000,000. The area and productive wealth of Egypt would be augmented by more than one-third.

Mr. Whitehouse and those who are interested with





STORAGE OF THE NILE FLOOD.

A. S. Gilling  
B. C. Dyer  
D. C. of Minor Works

2072.

him have made an offer to the Egyptian Government to find the money necessary for the undertaking, and also to keep the works in operation on very easy terms, giving the Government the right to purchase them ultimately at a low price.

The conception of this enterprise is entirely due to Mr. Cope Whitehouse, who has displayed remarkable energy and perseverance in vindicating and perfecting his plans in the face of discouragement and incredulity.

MR. WHYDAH.—Strange things are done in Africa—and elsewhere.

The *Revue Française*, of October 1, tells us that Admiral Hewett blockaded the coast of Dahomey, in the year 1875, in order to punish the king of that country for outrages upon "Mr. Whydah," an English merchant.

It is true that an Englishman was ill-treated in Dahomey and that a British man-of-war did exact reparation for the wrong in 1876, if not in 1875; but "Mr. Whydah" is evidently the well-known seaport on the Slave Coast.

The *Revue*, without the fear of La Fontaine before its eyes, has taken the Piræus for a man.

BRITISH EAST AFRICA.—Whatever may be the outcome of the British and German debate concerning Zanzibar, the African mainland in that neighborhood seems to be worth an effort. Mr. H. H. Johnston, who should know something of the matter, writes in the *Fortnightly Review*, for October, an article all aglow with admiration of the beauties and the resources of the territory ceded to the British East African Com-

pany, the "germ of a great empire of which it is the natural outlet."

The region covers 67,000 square miles, and stretches in a N. W. direction from the Indian Ocean to the Victoria Nyanza, its S. boundary rounding the base of Mt. Kilimanjaro, now a German mountain, and the N. limit lying beyond Mt. Kenia, which, being British, is or ought to be the loftiest peak in Africa.

The land is well watered and well wooded, a country of highlands and plateaux, with the climate and the flora of the temperate zone, though there is a tropical heat in the following description :

"The dazzling snow peaks suspended in the blue heavens, the black gulfs of the mile-wide craters, the countless cascades of the mountain torrents, the jagged outline of the distant violet-grey sierras, the shimmering azure of the hill-encircled lakes, the wide, breezy, grassy plains dotted with red ant-hills and slowly-moving herds of antelope and wildly-careering ostriches, the satin sheen of the banana plantations, the sparkling crystalline whiteness of the salt plains, the graceful clumps of bluish-green papyrus in the shallow pools and marshes that are the habitat of pink flamingos, white egrets, grey pelicans, and the Hagedash ibis, which is a walking rainbow ; the luxuriant greenery of the tropical forests, with their velvet-foliaged albizzias, their stately sterculias, sycamores, and parinariums, their india-rubber creepers, their emerald-green Ensetes (wild plantains), their wild date-palms, and their plume-like Raphias with the blood-red midribs to their fronds ; the natural parks, planted (by Nature) with clumps of shady acacias and "specimens" (one almost expects to see the name-ticket on them) of

elegant *Borassus* palms, and the orange-painted, branching, bushy *Hyphoene thebaica*, with its glaucous-colored, fan-shaped foliage."

The flight so well begun sinks into prose towards the end, and the writer is able to tell us calmly enough that the soil of British East Africa will produce nearly everything. Cattle abound, and the climate is favorable to all the domestic animals. The greatest heat registered near the E. of Kilimanjaro was  $81^{\circ}$ , and in the warmest part of the interior  $91^{\circ}$ . The average night temperature in the hilly districts is  $60^{\circ}$ ; in the plains  $68^{\circ}$ .

On the Victoria Nyanza there are a few rainy days in each month; but in the rest of the country, from June to the end of October there is almost no rain, and between November and May there is an abundant rain-fall during certain months.

The population is divided into the Masai and their helot races on the plains, and the Bantu peoples in the mountains. It is everywhere thin, except on the Victoria Nyanza, where there are between ten and twelve millions of people. The Bantu is everywhere a cultivator and a born trader. The Masai, formerly professed robbers and cattle-lifters, are learning to enjoy the sweets of traffic, and Mr. Johnston has great hopes of them. On the whole, if the country to the S. of Kilimanjaro is like that to the N. of it, Germany and England may conclude that the lines have fallen to them in pleasant places.

Mr. Johnston thinks the wild animals, and especially the lion, should be protected; though how the lion is to be preserved without sacrificing other beasts he does not explain. "The lion and the tiger," he says, "should be

regarded as privileged animals;" and he thinks it a most pitiable thing that the Government of India persists in exterminating the tiger. As a disciple of Malthus, Mr. Johnston is perhaps convinced that the population of India is rapidly overtaking its means of subsistence, and he values the tiger, accordingly, as an active member of the Society for the Suppression of Hindoos. This view of the case would meet with general recognition, if Johnston were a Hindoo family name.

A CORNER OF DUTCH NEW GUINEA.—A paper in *Cosmos*, Vol. IX., No. VII., by F. S. A. De Clercq, Dutch Resident at Ternate, describes a visit made in 1887 to the islands of Kumamba, Mor, and Wiak, on the eastern side of Geelvink Bay. With this paper begins a series of articles on Papuasia, in continuation of those published several years ago in Vols. I.-IV. of *Cosmos*.

It is not easy to identify places in New Guinea, for the maps give one name, the traders another, and the natives a third—and the true one—to the same point, or island. The three islands above mentioned are grouped on the maps as the Arimoa, while they are known to the natives in the order given as Liki, Lansutu, and Armofin.

Mr. De Clercq stopped first at Liki, where canoes, each carrying one or two men, put off to meet the steamer. Each canoe was made of the trunk of a tree hollowed out, and the sides were raised by boards fastened on at such an angle as to interfere with the freedom of the rower when seated. This method of construction is found on other parts of the coast, and had its origin in the practice of standing up to manage the long oars;

though in the present case the rowers sat with one leg over the other.

The natives, when they boarded the steamer, were friendly and entirely at their ease. They were robust and healthy looking, with dark skins and very thick hair, and some had full beards; their hair hung down in tresses, and some wore a kind of wig or skull-cap.\* Very many wore, hanging from the nose, two hog's teeth, and a band of dogs' teeth passed around the chest and under the arms to the back, a collar of round bits of shell, and on the legs and arms tight, woven bands; these, and a patch of shredded bark secured around the middle, made up the whole costume. Their arms were long arrows and carved bows.

The women were withered and ugly. They wore their hair in tresses and had thin pieces of shell thrust through the nose. For clothing they had two aprons of bark, one hanging in front and one behind, and fastened with a rattan cord, and they wore a profusion of trinkets made of the pith of the scarlet *saga* bean and ornaments of tortoise shell. A string passed around the forehead and behind the ears sustained a bag in which were carried tobacco and pinang (betel); and in the bracelets of the forearm were stuck little spoons made of pigs' teeth and used for scooping out the cocoanuts.

The island was covered with a dense vegetation, which hid from sight the few settlements. One of these, called Béarikwar, was examined by Mr. De Clercq. There were two rows of houses, about 40 in all, built at

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\* These wigs, called *dubirau*, were made of human skin, taken ordinarily from the heads of those who had died a natural death. To keep them in their place, they are tied with a ribbon around the forehead.

regular distances in a direction from southwest to northeast, with a broad street in the middle and a temple at the eastern end. The houses rested on posts about 3 feet high and were surrounded by fences made of the ribs of the sago-palm leaves, carefully bound together. There were two openings, one in front and one in the rear, and each closed with a kind of portcullis, made also of the sago-palm. A tree-trunk, with steps cut in it, led to the opening. The roofs were of palm-leaves and descended to within about 18 inches of the ground. The enclosures were planted with the laurel-like *codiæum*.

The temple, which is called *tosi*, had no visible opening, all the cracks even being closed with dried leaves. The people vie with one another in making offerings to the spirits of the departed; but the custom is for the youths to assemble in a small building at a little distance. When the western trades blow, bonfires are kept up around the *tosi* day and night. The men meet and pass their time in singing to the sound of the flutes and the *tifa*. Dishes of various kinds are kept ready prepared in the houses and are brought by the young men, and sometimes fires are made of the fruits of the forest. The purpose of these ceremonies is to ward off misfortunes by doing homage to the spirits. It is in the temple that the heads of enemies slain in battle are deposited. Access to the temple is forbidden to the women, and no one is allowed to speak or to make a noise near it; but the uproar and the shouting within have no limit.

Usage requires a man to carry off his wife by force. In the struggle the man is slightly wounded with an

arrow, and then the girl is given up, so that she may cure him. The dowry consists of strings of dogs' teeth and other ornaments.

The natives count as far as five: *tès, lu, taur, fau, lim*. They have a word for ten, *sinafun*, and they count also on their fingers, but they never go beyond five. They seemed to be on good terms with their neighbors.

In the island of Mor, Mr. De Clercq found the people not so dark as those of Kumamba, whom in general they resembled. Their houses were unlike the other Papuan dwellings, so far as concerned the interior arrangement. There was but one room, and in this, at the height of about 3 feet from the floor, were oblong niches around the wall, at a short distance apart, closed on four sides and provided with a little quadrangular opening on the inside. These were sleeping-places; and alongside of them were baskets, filled with domestic utensils, provisions, and fire wood; and in one corner a layer of sand and a few cylindrical stones formed the kitchen.

From the roof were suspended the dishes and arrows and fishing apparatus.

The natives employ themselves in fishing, and in agriculture, this being the work of the women.

When any one dies his relations carve an image, and to this a special value is attached. Mr. De Clercq was unable to procure one, the belief being that he who parts with such an image will speedily perish by a violent death.

The people of Mor carry their numeration beyond that of their neighbors. From one to five the names are: *tata, rurò, òrò, aò, rimò*. Six is *rimò tata*, seven *rimò*



*rurà*, and so on to ten, which is *taurà*. Eleven, *taurà tata*, begins a new series of repetitions, up to twenty, which is *nautata*. Beyond twenty Mr. De Clercq does not go.

In a note to this paper Mr. Guido Cora, the editor of *Cosmos*, very properly calls attention to the fact that Mr. De Clercq's more extended observations corroborate the report made by the distinguished Italian traveller Beccari, who saw these islands in December, 1875, from the deck of the Dutch transport "Soerabaja."

The commander of this vessel, it is said, allowed Beccari just *five minutes* to get what information he could from the islanders who boarded the steamer, which was so far from being short of fuel that when she had reached Dorei (at the N.W. extremity of Geelvink Bay), there were still 200 tons of coal aboard.

"Probably," says Mr. Cora, "it was not desirable to give the Italian explorer an opportunity to visit places not yet well known to the Dutch."

This may be true, but then again it may not; and there does not seem to be any great difference in spirit between the Dutch commander's supposed jealousy of the Italian and Mr. Cora's readiness to think evil of the Dutchman.

DOMINGO F. SARMIENTO.—This distinguished man, ex-President of the Argentine Republic, died on the 11th of September at Asuncion, Paraguay, in the 78th year of his age. He had spent, says the *Boletín del Instituto Geográfico Argentino*, sixty-two years in the service of his country, taking an active part in all public concerns, coming into collision with prejudices, and fac-

ing in the ceaseless struggle the fury of passion, but preserving from the beginning to the end a reputation without spot or blemish.

His zeal in the cause of education and his liberal ideas had brought him into relations with many of the most enlightened men in the United States and in Europe. He was an Honorary Member of the Argentine Geographical Institute, and freely used his influence and his means to promote the exploration and development of the vast national territory.

CESARE CORRENTI.—This eminent Italian, equally remarkable as a patriot, a statesman, and a scientist, died at Meina, on Lago Maggiore, on the 4th of October last, at the age of 73 years.

The *Bollettino* of the Italian Geographical Society, for October–November, says of him:

“From the foundation of this Society he was among its most earnest supporters and associates; he was its President from the year 1873 to 1879; it was he who organized and sent out the Italian expedition to Equatorial Africa, under the conduct of the Marquis O. Antinori; and he was unwearied in promoting the interests of the Society, and the progress of geographical exploration and of geographical studies in Italy.”

PRJEVALSKY. — This Russian geographer, one of the greatest among the explorers of Asia, died recently (the date not given) at Vyernyi, in the Eastern Thian-Shan Mountains. He was making ready for a fifth attempt to reach Lhasa, the Holy City of Tibet, from which he had been so often obliged to turn back.

More than any other man, Prjevalsky established the geography of Central Asia on a firm foundation. He possessed all the qualifications of a scientific traveller, and his death, at the early age of fifty, is an irreparable loss.

WILLIAM GIFFORD PALGRAVE.—Mr. Palgrave, whose work on "Central and Eastern Arabia" has been a classic for twenty years, died on the 30th September at Monte Video, where he had been for some years the British Minister-Resident and Consul-General. In Uruguay his special qualifications as an unsurpassed Arabic scholar and Orientalist were certainly wasted, and the sharp criticisms made upon the Government for relegating him to such an exile may be said to have been deserved; but Governments must often do what they can and not what they would.

Mr. Palgrave was a Jesuit priest when he went to Arabia on a mission from the Emperor Napoleon III. Soon after his return he left the order, entered the service of his own Government, and held successively various consular posts.

Besides the "Arabia," he wrote "Essays on Eastern Questions" and "Dutch Guiana," both works of permanent value.

LA GEOGRAPHIE.—A fortnightly journal, under this name, made its appearance at Paris, on the 15th October.

It is intended to aid in the diffusion of geographical knowledge in France. The number of November 25 contains a letter from Charles Soller, the African traveller, and an original map, on a scale of 1 : 8,000,000, from his notes of the caravan routes in the Western Sahara.

*Ancient Rome in the Light of Recent Discoveries.—*  
*By Rodolfo Lanciani, LL.D. (Harv.) With One Hun-*  
*dred Illustrations. Houghton, Mifflin & Co., Boston and*  
*New York, 1888.*

This beautiful book is nothing less than a revelation, even for those who have had from time to time a hint of the work that was going on in Rome; for here they find disposed in order, and explained, the discoveries that have reconstituted within fifteen years the whole subject of Roman archæology.

Mr. Lanciani is the Director of Excavations for the National Government and the Municipality of Rome. One year ago he visited America, and gave, in a course of lectures, an outline of the changes in Rome.

A few lines of statistics from his preface are impressive. In the 14 years between January 1, 1872, and December 31, 1885, 82 miles of new streets were opened, paved, drained and built; new quarters have sprung up which cover an area of 1,158 acres; 3,094 houses have been built, or enlarged, with an addition of 95,260 rooms. The objects brought to light by these operations are innumerable, and Mr. Lanciani does not pretend to have counted them; but the Capitol alone has been enriched since 1872 with the following articles: 705 amphoræ, 2,360 terra-cotta lamps, 1,824 inscriptions on marble or stone, 77 columns of rare marble, 313 pieces of columns, 157 marble capitals, 118 bases, 590 works of art in terra cotta, 405 bronzes, 711 gems, intaglios and cameos, 18 marble sarcophagi, 152 bas-reliefs, 192 marble statues, 21 marble figures of animals, 266 busts and heads, 54 pictures in polychrome mosaic, 47 objects of gold, 39 of silver, 36,679 coins of gold, silver and bronze, and an

almost incredible amount of smaller relics of every material.

There have been discovered the stratum of prehistoric or traditional antiquities; a necropolis older than the walls of Servius Tullius and containing more than 5,000 archaic specimens; more than 5,000 feet of the great *agger* of Servius, and the site of fourteen gates; and the remains of numberless houses and palaces, temples and shrines, roads and drains, porticoes, etc., covering an area of 3,967,200 square metres of the ancient city.

Mr. Lanciani deals very plainly with the false sentiment that has so loudly bewailed the ruin wrought in the picturesque old Rome by these works of excavation and improvement. To satisfy such a sentiment, he says, it would have been desirable to have had Rome annihilated at the end of the fifth century, so that it might be excavated as a buried city. It might be added that the living inhabitants of a famous place have a right to live and to move, to build and to rebuild their home; and, further, that the people of London and Paris and New York, who fancy that Rome is dearer to them than to the Romans, would do well to inquire how many of the historic parts of their own cities have been sacredly preserved.

The book is brought out in a style every way worthy of its fascinating contents.

*Western China: A Journey to the Great Buddhist Centre of Mont Omei.*—By Rev. Virgil C. Hart, B. D. Fellow of the Royal Asiatic Society. Illustrated.

*Boston: Ticknor & Co., 1888.*

Mr. Hart, with three companions, the Rev. Ernest

Faber, Arthur Morley, M. D., and the Rev. H. O. Cady, left Hankow early in April, 1887, for the West of China, their object being the re-establishment of the American Methodist Episcopal Mission at Chung-King, the scene of the destructive riot in July, 1886.

A long residence in China, and a thorough acquaintance with the language and the people, enabled Mr. Hart to profit by what he saw and heard, and he has produced one of the most instructive of recent works on the great Empire.

As far as Ichang the voyage was made in a steamer; beyond that point in native boats. The country was everywhere well cultivated—in some places remarkably so—and the scenery in the frequent gorges and along the rapids was strikingly grand. Sz-Chuan is one of the richest provinces of China, and seems to produce in abundance nearly every kind of crop, from potatoes to cotton. Near Kwei-cheu, a town which contains 2 mosques and 500 Mohammedan families, besides a Roman Catholic Church and 100 families of that faith, Mr. Hart first noticed the poppy plantations.

These became more numerous farther on, and of one place, beyond the Hu rapid, when the travellers had gone ashore to visit a little town that charmed them with its situation in the midst of well-cultivated hills and fields and its aspect of prosperity and cleanliness, Mr. Hart writes:

"The sallow complexion of the people, their emaciated forms and languid movements, attract our attention. . . . I do not see a beautiful face or figure, nor a rosy cheek; a dead leaden color is on all faces, old and young, male and female. . . . Upon the mountain sides

are houses and hundreds of workmen; approach those busy laborers and you will see this death-like pallor on all faces. The climate seems the acme of perfection . . . yet there is a want of energy and life among the people."

The explanation of this shadow of death over a busy community of laborers is found by Mr. Hart in a poppy-field; and he apostrophizes the "seductive viper, curse of millions," without perceiving that his description proves too much. If the opium-eating laborers are listless and devoid of energy, who keeps up the cultivation of the smiling region, with its superabundant products

It was at the end of June that Mr. Hart and Dr. Morley left Chung-King to make their way in sedan chairs and by water to Mount Omei. On the way they distributed or sold a number of the Scriptures and tracts, but Mr. Hart's satisfaction in this good work was not unmixed, for on his return he found the people of one place gathered around a bonfire and feeding it with the books he had left among them.

The travellers went out of their road to visit the great salt-wells at Tsz-liu-tsin, about 175 miles S. W. of Chung-King. The frames, from 60 to 160 feet in height, above these innumerable wells, are visible at a distance of ten miles from the city. The wells, 6 inches in diameter, are bored through the solid rock to depths of from 2000 to 5000 feet; and they have been in operation for 1700 years. A particular well sometimes gives out and remains dry for an indefinite time, and then begins to flow again. The brine is carried to the boiling-vats through bamboo pipes. Mr. Hart saw the operation of hoisting the full tube at one well. Three water-

buffaloes turned a horizontal wheel, 22 feet in diameter, and brought up in a few minutes from a depth of 3300 feet about 300 lbs. of the brine. The manager of this well, when asked how long he had been in the business, laughed and replied : " Ever since the first Emperor of the Min dynasty ; for twenty generations, sir." Mr. Hart regards the establishment and maintenance of these wells as the greatest of Chinese achievements, not excepting the Great Wall.

Mount Omei lies about two days' journey beyond Kia-ting-foo, on the upper Yang-tse-kiang, and is described as " a centre of natural and artificial wonders, the like of which may not be found elsewhere upon the globe ; " a description which a good many other persons might be found ready to apply to a good many other places. There are mountains chiselled into the forms of idols, colossal bronze statues, pagodas, and one temple of rich bronze, and, above all, the Great Omei mountain, rising more than 11,000 feet in height. All these wonders are found within a radius of 40 miles from Kia-ting-foo. A mile or two below the city, on the face of a cliff that goes down sheer to the water, is the famous sitting Mi-lêh Buddha, a figure carved out of the solid rock, and over three hundred feet high. There are small trees growing from the head of this statue.

The bronze temple, already mentioned, no longer exists. It was destroyed by fire in 1851 and now lies in a heap of twisted and broken metal. It was sixteen feet square and thirty feet in height, in three stories.

Mr. Hart devotes nearly 100 pages to the description of this far-away wonderland, and closes with some suggestions for more effective missionary work in China.



*The Capitals of Spanish America.*—By William Eleroy Curtis. Illustrated.

New York: Harper & Brothers, 1888.

Mr. Curtis was a member of the South American Commission, appointed by President Arthur to visit the countries of Central and South America for the purpose of establishing closer commercial and political relations between them and the United States.

Out of this mission came the present work. There was a book to be made, and Mr. Curtis has made it by gathering facts and the semblance of facts out of other books and working them into a kind of shape with observations of his own, some happy and just, but much the greater part wholly beside the mark. He had no preparation for the task he undertook. The evidences of his misinformation concerning Spain and Spanish America, the Spanish language, and, in a word, all things Spanish and Portuguese, abound throughout his pages. Some of the blunders are undoubtedly due to the proof-reader, but it is Mr. Curtis himself who calls the Chilenos *Chillanos*, and makes the Spaniards shout in Norman French, *Oyez, oyez*, at the telephone, and translates *Maria Carmen*, "Mary of Blood." The Portuguese name, *Rio de Janeiro*, being unfamiliar to mankind, Mr. Curtis writes out for it a pronunciation, the only use of which will be, in the words of the famous New Guide, "to make any one speak very bad the fore-mentioned idiom;" and strong in innocence as in triple mail, he does not shrink from complimenting educated Mexicans on their knowledge of their own tongue.

His references to ancient history, sacred and profane, are not less original than his Spanish and Portuguese.

Guatemala, he says (p. 68), was buried, "like Sodom and Pompeii," by a mass of ashes and sand; and we are told on p. 701 that Demosthenes could make an audience weep or laugh at will by "simply uttering 'Mesopotamia.'"

The volume is rich in illustrations, many of them old acquaintances, and, naturally, somewhat the worse for wear.

*Leaves from an Egyptian Note-Book.*—By Isaac Taylor, M.A., Litt. D., Hon. LL.D., Canon of York.

London: Kegan, Paul, Trench & Co., 1888.

Canon Taylor's book consists of notes of conversations with Egyptians on politics and religion. "I went to Egypt," he says, "the head-quarters of Islam, in order to investigate the truth of certain assertions which have of late been freely made as to the barbarism, ignorance, profligacy and intolerance of Mahommedan nations. . . . I have held long and interesting discussions, not only with Europeans resident in Egypt, and with men who fill important posts in the Egyptian government, but with Moslems of every class, who have conversed, without reserve, on the tenets of Islam, and on the condition and prospects of their country and their religion."

Mr. Taylor found, among the Pashas of Cairo and in the schools a degree of culture for which he was not prepared. In one day he visited two Pashas, who were well up in mathematics, and generally so highly cultivated that he asks how many morning calls one would have to pay in London before coming across hosts so intelligent and so accomplished. The answer depends upon circumstances. If Canon Taylor called upon the

right persons and found them at home, he would come across more than two Pashas in London who could discuss Darwin and mathematics with him.

There was no sign in Cairo of the intolerance imputed to Mahommedans. The people are sincere believers, but Mr. Taylor thinks there is less religious fanaticism in Egypt than in England. He found the learned Moslems familiar with the Bible as well as with the Koran, and he quotes the liberal expressions of one scholar with whom he talked : " We," said the Moslem, " welcome the fullest discussion ; it can only serve to bring out the truth . . . . Our religion, like yours, has been corrupted . . . . If we return to the pure teaching of Mahommed, and you return to the pure teaching of Jesus Christ and his Apostles, we shall find few points of difference to divide us."

The Pashas were ready to speak, not only of religion, but of polygamy and morals ; and they astonished Mr. Taylor by telling him that 95 per cent. of their class in Cairo had only one wife. All the Mahommedans with whom Mr. Taylor conversed were, without exception, in favor of the legal prohibition of polygamy ; and one, a lawyer, said that if the Khedive were to issue an ordinance to that effect, it would be accepted without serious objection.

As for the personal morality of the Pashas, and their freedom from vice, Mr. Taylor had the direct testimony of the gentlemen themselves. They assured him that they were respectable persons, and that their lives were beyond reproach.

Three of the time-honored Egyptian institutions, the *kourbash*, or whip, the *corvée*, or forced labor, and slav-

ery, find favor in Canon Taylor's eyes. Pasha and peasant alike think the abolition of the *kourbash* was an English mistake; the Pashas, because it has made government more difficult, and the peasants, because they prefer the stick to the prison. The *corvée*, which also has been suppressed, had made it possible to execute the great public works in Egypt, and the objections to it are, Mr. Taylor thinks, sentimental rather than practical. His conclusion with regard to slavery has a strangely familiar sound of the olden time: "The slaves whom I have seen were sleek and well clad, and did not appear to be discontented with their lot."

The main argument of the book, if it be not meant for an imitation of the *Lettres Persanes*, is that Egypt ought to be governed by the English after the immemorial Egyptian methods. The labored comparisons and contrasts of Christian with Mahomedan religious faith and morality, personal and social, have no serious meaning. The subjects are at once too complicated and too intangible to be dealt with; and common sense refuses to believe that the average human nature, even of Mahomedans, moves on any such lofty plane as that described by the Canon of York.

It may be a question whether the English ought to be in Egypt; but there they are, and it is their duty to see that the country is governed with all possible regard to their responsibilities as a civilized nation.

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*Mittheilungen von Forschungsreisenden und Gelehrten aus den Deutschen Schutzgebieten.*

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## CHARLES H. BALDWIN.

Rear Admiral, U. S. Navy.

BORN, SEPTEMBER 3, 1822, IN NEW YORK CITY.

DIED, NOVEMBER 17, 1888, IN NEW YORK CITY.

Admiral Baldwin entered the Navy, as a midshipman, April 24, 1839 ; in the war with Mexico was several times engaged with the enemy about Mazatlan ; and, February 28, 1854, resigned his commission, being then a lieutenant.

For seven years he pursued a successful career in the mercantile marine ; upon the outbreak of the rebellion promptly tendered his services in defense of the Union ; commanded a steamer in Farragut's passage of the river forts and capture of New Orleans ; and actively participated in the first attack on Vicksburg, Miss. During the continuance of the civil war his duties were varied and arduous ; and, when peace was restored, his responsibilities increased with his increasing rank. He was promoted to be a Rear-Admiral, January 31, 1883, when he was assigned to the command of the European Squadron, in which elevated position he did the honors of our country with generous hospitality and courtly dignity.

Admiral Baldwin, after his retirement, September 3, 1882, began to decline in health, and this made it necessary for him to spend his winters in the genial climate of the Mediterranean Riviera. Upon his last homeward voyage he had a fall, from which he was too feeble to rally. Death terminated his sufferings November 17, 1888, at the early age of sixty-six.

During the last twelve years of his life, Admiral Baldwin was a Fellow of the American Geographical Society, and for seven of them a member of its Council. His associates recall with affection the charm of his manner, his quick intelligence and liberal culture, his force of character and nobility of nature, and sincerely mourn the loss of this brave and sterling officer, who faithfully served his generation, and bore an emphatic witness to the worth of manhood.

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